RAILROAD GAZETTE

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Contributions.

Oil on the Roadbed.

Pennsylvania Railroad,
Tyrone, Pa., March 28, 1900.

To the Editor of the Railroad Gazette:

I see in your issue of March 23 that I am quoted as corroborating what was said at the meeting of the American Railway Engineering and Maintenance of Way Association in Chicago on the 14th inst. as to the application of oil to roadbeds. What I did say was, after giving some approximate figures as to the cost, "that I had heard something as to complaints from passengers of the accumulation of oily dust on their clothes, but this was only report; that the application was being discontinued on certain portions of the road owing only to the fact of the desirability of putting that portion of road in stone ballast." It was not discontinued because of any complaints as far as I know, and the application did all that it was claimed it would do. Personally I consider it a most excellent and economical device for laying the dust, and thus being easier on rolling stock and of greater comfort to the travelling public.

Your paper is such a reliable one that I am loath to be misquoted in it, and while it is a matter of comparatively small moment, I must beg of you to correct the impression conveyed.

S. L. SHOBER, JR.,
Ass't Engineer.

Heavy Compound Freight Locomotives.

Northern Pacific Railway Company.
St. Paul, Minn., March 27, 1900.

To the Editor of the Railroad Gazette:

I was much interested in the editorial on heavy compound freight engines in your issue of March 9. You may be interested in my formulation of the conditions under which the compound engines will do the best work, viz.: "The commercial efficiency of the compound engine, as compared with the simple engine, is highest when the difference between the maximum and the average rates of grade is least." Compound engines maintain a higher mean effective cylinder pressure in combination with a higher ratio of steam expansion and have the advantage of the simple engines in this respect. For this reason the former have been found to be most economical, where both speed and tractive power must be continuously maintained, as on grades of uniform rate. It is not, however, generally recognized that compound engines will make the best showing on level grades, where the advantages of the compound feature may be secured in both directions; while simple engines will make the best comparative showing in undulating districts with high maximum grades, where they can work steam expansively in the cylinders and at the same time maintain a high average rate of speed. Under similar conditions the compound engine will show but little coal economy. It is safe to conclude that this accounts for many failures to realize the anticipated economy in the use of compound engines.

E. H. McHENRY,
Chief Engineer.

Tie Treating.

By O. Chanute, Past Pres. Am. Soc. C. E.

The preservation of crossties by the injection of chemical substances dates back nearly to the beginning of the railroad era. The English had then nearly a century of experience in the preservation of wooden ships, and had tested all sorts of antiseptics. "Kyanizing" and "Burnettizing" were applied to ties about 1838, and creosoting was introduced by Bethell about the same time. By 1853, it had established its superiority for the conditions existing in Great Britain, and it has been almost exclusively used ever since. Practically all ties now laid in England are creosoted.

In France, Dr. Boucherie introduced his process for ties about 1840, using chiefly sulphate of copper*, and Burnettizing and creosoting were shortly afterward brought into use. All the French railroads, save one, now treat their ties, chiefly by creosote, and they obtain results superior to those of most other nations.

In Germany Rütgers began treating ties in 1849, first with barium and green vitriol, and then with creosote; later he tested sulphate of copper and chloride of zinc, and had treated altogether some 57 millions of ties to the beginning of 1896.

Other European countries have one by one taken up the practice of treating ties: Belgium, Holland, Denmark, Switzerland, Spain and Portugal; the latest converts being Russia and Roumania, which latter is now building a creosoting plant. So that ample experience for 60 years has now been gained abroad, and the economy and expediency of tie treating is so well established that a railroad manager abandoning it there would occupy about the some position as a railroad man in America who went back to iron rails. It may be said in general terms that all the leading roads of Central and Western Europe now treat their ties by some process before laying them down.

Scores of antiseptics and of methods were experimented with in Europe, so many as eight being still in use in Germany down to 1884. As might be expected, some mistakes were made and experience was gradually evolved. As a result, recent information shows that but two antiseptics now remain in extensive use, chloride of zinc (Burnettizing), and coal-tar oil (creosoting), and that the latter is constantly gaining over the former. The methods of injection have also been gradually improved in details, so that it may almost be said that the impregnation of wood has become an art, now carried on by experts, and that when the time comes for an American road to take up the subject practically, it will be well to learn from those who have had the required experience.

In the United States the railroads began experimenting nearly as soon as in Europe; the earliest on record being the Northern Central Railroad, which preserved some of its ties by steeping in corrosive sublimate as early as 1838. Other roads tried various other processes, but timber was yet too cheap to warrant the increased expense, and by 1860 no plants remained in use in the United States for the treatment of ties, although Kyanizing and Burnettizing were carried on in a small way for the treatment of bridge timber, and some creosoting works were in operation for the preservation of wood against the marine worms.

Little was done during the ensuing 25 years. Some experiments were tried, part of which proved failures, and part were successful, but upon the whole it had been concluded that tie-treating would not pay, when fresh attention was called to the subject in 1885, by the report to the American Society of Civil Engineers on "The Preservation of Timber;" the investigation having been prompted by the revelation of the census of 1880 concerning the impending depletion of our forests. This report went into the subject thoroughly and analyzed the results of some 150 American experiments, giving besides such European data as were then available. It induced a number of sagacious roads to take the lead in preserving some of their ties upon a considerable scale, and the fairly satisfactory results thus far achieved have been given in the paper of Mr. W. W. Curtis to the American Society of Civil Engineers, reviewed in the Railroad Gazette of Nov. 10, 1899.

The Cost and Economy of Treating.

It has been abundantly proved that creosote is the best preservative known, but it is also the most costly. In England, at a cost of 25 cents per tie, it lengthens the life of Baltic redwood sleepers to 15 or 16 years, so that about 6 per cent. has to be renewed annually. In France, where more tar-oil is injected, at a maximum cost of 64 cents each, it extends the life of pine and beech to 25 or 30 years, so that the annual renewals in that country are about 4½ per cent. In Germany it confers from 20 to 23 years in the track upon pine, and 30 to 34 years upon beach, at a cost of 54 to 59 cents each for treatment, the average renewals in that country being about 6½ per cent. a year in consequence of the use of other processes. Creosoting is effective nearly in proportion to the quantities injected and consequent cost, and would be still more expensive in this country, in consequence of the higher price of tar-oil.

Our roads have been laying down white oak when it could be procured. Its life has been a little over 8 years, so that the renewals have been from 9 to 13 per cent. annually. It has been proved that treatment with chloride of zinc extends the duration of pine and hemlock ties to averages of 9 to 12 years, at a cost of 10 to 18 cents for treatment, and that still better results may be expected from recent improvements in some of the processes. These will probably extend the average life to 12 to 15 years and reduce the annual renewals to 7 or 8 per cent., so that an economy will result wherever a treated tie of inferior wood can be obtained at about the same price as a white oak tie. It may be approximately figured that upon a road where the tie renewals average 243 a year per mile (9 per cent. in 2,700) the reduction of this to 7 per cent. a year will save 54 ties a year a mile, which, at a cost of 60 to 80 cents each—including 15 cents for putting in track—will produce an annual saving of $32.40 to $43.20 per mile of all tracks, and will moreover tend to keep down the future prices of the durable woods, which have increased from 20 to 40 per cent. during the past year. This recent increase in prices has greatly added to the importance and expediency of tie treating.

* A sound tie treated in 1843 was on exhibition at the Paris Exposition of 1889, after 46 years in the track.

Visibility and Confusion Tests of Signal Glasses.

Prof. Louis Derr, of the Massachusetts Institute of Technology, has recently made some interesting tests of the "nels yellow," "nels green" and "nels red" glasses made by John C. Baird, of Boston, for use in railroad signals, and the substance of his conclusions is given below. The characteristics of Mr. Baird's glasses, especially the yellow, which was devised to meet the requirements of the New York, New Haven & Hartford for distant signals, are already familiar to the readers of the Railroad Gazette from accounts published in these columns during the past year.

Prof. Derr first tested the glasses in an ordinary photometer. The yellow and green glasses were 0.22 in. thick and the red 0.11 in. thick. It was found that the yellow absorbs 67 per cent. of the light, the green 95.4 per cent. and the red 90 per cent. Therefore, the yellow transmitted 33 per cent. of the light, the green 4.6 per cent. and the red 10 per cent.; or, taking the brightness of the yellow as 1, that of the green was 0.14 and of the red 0.33. If the yellow could be seen a mile away the green would be visible at about 2,000 ft. and the red at about 3,000 ft.

These experiments with the photometer were not very satisfactory, however, as this instrument is designed not to compare colors but intensity; and different observers will record different measurements when the attempt is made to test colors. Mr. Derr therefore made a test, in a room about 75 ft. long, by using a light in a dark box with an aperture small enough to make the light invisible at about 75 ft. Inside the box he placed an incandescent lamp, varying the brightness of the light disk shown through the hole by adjusting the lamp at various distances back of the hole. The tests were made at night, but the room was not perfectly dark. The observer, starting from the light-box, backed away from it until the light vanished, and then laid a card on the floor. After going still farther away he then walked forward until the spot of light became again visible, and marked this point by laying another card on the floor. This process was repeated with the different colors, and the distances were afterward measured. The results, omitting details and precautions, were as follows: (relative vanishing distances) white light (no glass), 1; yellow, 0.580; green, 0.385; red, 0.163. On this basis, with yellow visible at one mile, the uncovered (white) light would be visible at 9,100 ft., the green at 3,500 ft. and the red at 1,400 ft. Prof. Derr regards these values as much more reliable than those deduced from the photometer measurements. The conditions are more nearly those of actual service with outdoor signals.

The foregoing figures are, of course, only comparative. The usual signal lights can be seen much farther than this.

To test the liability of mistaking one color for another two lights were used, in boxes side by side. At a distance it was easy, with this test, to distinguish the different glasses simply by their intensity, a very dim light being called red and a very bright one white. Next the lights were reduced to the same brilliancy, by placing the lamp for the white or open aperture farther back in the box. With this arrangement two colors of unequal brilliancy were made to vanish simultaneously as the observer backed away from them. The first test was with one opening uncovered and the other covered by a yellow glass. When both lights are fairly brilliant they are quickly distinguished, but when very feeble the identification is not easy. With yellow and red, both fairly bright, there is no difficulty whatever in distinguishing; but at a distance, both lights being on the point of vanishing, it is easy to mistake one for the other. To see if either white, red or yellow could be mistaken for green an extended series of tests was made. But with all of these—green and white, green and red or green and yellow—it was impossible to confuse any of the colors with green. Viewed alone the white becomes yellower at great distances and the yellow becomes redder; but the green re-

mains uncompromisingly green until it vanishes. Where green and yellow are side by side the yellow appears red by contrast, and if feeble is readily mistaken for a red light.

Shops of the Mexican Central at Aguas Calientes.

The Mexican Central Railway works 2,000 miles of road; the main line running south from Ciudad Juarez to the city of Mexico, 1,224 miles, with two lateral branches, one east from Aguas Calientes to Tampico, 415 miles; the other west from Irapuato through Guadalajara to Ameca, 217 miles. The principal locomotive and car shop and the motive power headquarters are in the city of Mexico, with small repair shops at Chihuahua at the upper end of the main line, and at San Luis Potosi on the Tampico branch. When it was found necessary to provide more extensive shop facilities they were placed at Aguas Calientes, a more central point on the main line, and near the intersection of the Tampico branch, which carries the coal and other supplies and material, which are delivered by steamships at Tampico.

The equipment now consists of 207 locomotives, 120 passenger cars, and 4,213 freight cars, but a material increase in these numbers is evidently expected, as the shops, now building, provide for the repairs of a much larger amount of rolling stock. It would not seem wise to build construction shops for locomotives and cars in Mexico, as the country does not at present produce cheaply or in large quantities either lumber or iron.

Referring now to the general plant of the new shops, it will be seen that they occupy a yard about 4,000 ft. long by 800 ft. wide. This space is already graded and enclosed by an adobe wall 8 ft. high. That part of the 56-stall round house shaded in the engraving is also finished and occupied. It is a substantial structure built of concrete and with its square columns and Roman arches it looks quite monumental. It has no doors and no glass in the windows, the latter openings being simply protected by iron bars. The climate is so mild that no protection is needed from cold weather, and it is only necessary to provide a roof and sufficient side walls to keep out the rain. Advantage will be taken of this climatic condition in the construction of a number of the buildings, and the detail plans of them which we hope to illustrate will therefore be interesting. The buildings, which will simply have columns without complete side wals, are the wheel and axle shops, the boiler shed, the planing mill, foundries and hammer and smith shop. The locomotive shop is to be somewhat like the Boston & Maine plan (see Inset RR. Gazette, Feb. 4, 1898), with the erecting shop in the central portion, having three longitudinal tracks, and machine tools in the side wings of one main building. The boiler shop is also an extension of this main locomotive shop and occupies the whole width—150 ft.—without any partition between. The erecting and machine shop is 300 ft. long and the boiler shop 100 ft. long.

The Boston & Maine shop, which was intended to take care of the repairs of 300 locomotives, is 130 x 305 ft., and the boiler shop 70 x 105 ft. If we suppose the Mexican Central is intended for an increase in equipment of 50 per cent., or a total of 300 locomotives, then the locomotive shop provides 150 sq. ft. of shop floor per engine and the Boston & Maine 132 sq. ft. per engine.

The boiler shop capacity compares as follows: Mexican Central, 50 sq. ft. per engine; Boston & Maine, 24.5 sq. ft. per engine. The former being twice the latter and indicating either that the Boston & Maine shop is too small or the Mexican Central too large. We incline to the opinion that the Boston & Maine boiler shop would have been improved if the main locomotive shop section had been continued through the boiler shop full width, like the Mexican Central. A much larger floor space would thus have been obtained with less expensive side walls.

The Mexican Central plan shows by dotted lines that space has been provided for extensions of the locomotive, erecting and machine shop and boiler shop to double the size they will be built at present. On the basis of the Boston & Maine boiler shop this would provide for an equipment of 1,200 locomotives.

The erecting shop is to be provided with two 60-ton electric cranes, which will also run through and serve the boiler shop. The transmission of power to all shops will be by electricity. The power house is therefore located near the planing mill so as to use the shavings, sawdust and refuse from that place as well as scrap from car repairs. The power house is 60 x 110 ft., with boiler shed adjoining 60 x 60 ft. The line shafting in the machine shop is driven by four 10 h. p. motors in each bay, and two 10 h. p. motors are provided for machinery in each bay of the boiler shop.

The blacksmith shop is 60 x 200 ft., located near the boiler shop and in line with the store-house, which is 60 x 200 ft. The motive power office, 60 x 90 ft., is west of the smith shop and fronts on the line of the adobe wall. Directly north of the locomotive and boiler shop are the iron foundry, 60 x 150 ft., and wheel foundry, 60 x 100 ft., each of these having space allowed for ample extensions in the direction of length. This completes the iron working departments and at the extreme north end of the shop yard is the car department. The locomotive shops and car shops are thus widely separated by a distance of about 1,600 ft., with the lumber shed and material yard between.

The car shops are closely grouped together and arranged with longitudinal tracks. The coach repair shop and paint shop are each 130 x 300 ft. No shop is provided for freight repairs, as the mild climate permits that work to be done out of doors in all seasons. The freight repair yard is outlined directly east of the coach repair shop. The planing mill is 70 x 200 ft. and has two tracks leading directly to the dry kiln and lumber shed. It will be provided with six 30 h. p. motors. A cross track, with small turntables in each intersection with the longitudinal tracks, extends between the ends of the main car shop buildings and leads to the front of a long narrow building off to one side of the main yard tracks. This shop has a space 40 x 100 ft. at one end for car wheels and axles, and an equal space at the other end for freight truck work. Nine stub tracks lead to this shop, and they are connected by small turntables with the cross track leading to other shops. These stub tracks provide storage for wheels and axles and complete trucks. This small shop is the only one having tracks at right angles to the longitudinal axis of the shop, and it will be noticed that transfer tables are not employed either in the car or locomotive department.

The principal objections to transfer tables are the exposure of the table, its load and the pit to snow and storm in winter and the opening of large side doors every time an engine or car is moved or material delivered. But these objections do not obtain in Mexico, yet a shop plan involving the use of transfer tables has not been thought desirable by the Mexican Central officials.

It is interesting to compare this shop plan with that of the new shops of the Chicago Great Western at Oelwein, Wisconsin. In the latter all locomotive and car shops are served by one transfer table and most of the material is to be delivered to all shops by the same table. These shops are situated in a cold country where steam heat is required five months in the year, and the disadvantages of numerous side door openings and others connected with the cross track plan obtain to the largest extent. If climatic conditions were properly taken account of it would appear that the Oelwein plan would have been best for Mexico and the Aguas Calientes plan for Wisconsin. The two shops certainly present opposite extremes, those at Oelwein all depending upon one transfer table and those of the Mexican Central, which we have just described, dispensing with transfer tables entirely.

In connection with the new shops at Aguas Calientes there is to be a fine hospital, which is now building. A small park is laid out, and numerous adobe houses for laborers will be built. There is also clear space directly east of the shop yard where a town site is plotted. The famous hot springs of Mexico are quite near and free bath houses of a substantial and attractive character have been provided near the station by the municipality.

Mr. A. A. Robinson, the President of the Mexican Central Railway, has taken an unusual interest in the preparation of the shop plans. The general arrangement is due to Mr. F. W. Johnston, Superintendent of Motive Power, and we are indebted to him for the plan.

Traction by Compressed Air at Paris.

In 1876 experiments in traction by compressed air were begun in Paris by the Northern Tramway Company. In 1878 and 1879 the same company tried compressed air locomotives on the Mékarski system. For financial reasons, this experiment lasted only a few months. At that same date, M. Mékarski installed this system of traction at Nancy, where it is still in operation with satisfactory results and where it is now being increased.

In Paris compressed air traction was abandoned until 1894, when the General Omnibus Company applied it to four lines of its system. Three of these lines start in common from the Louvre and branch off to St. Cloud, Sèvres and Versailles. Another line goes from St. Augustin to Vincennes. The line to Vincennes went into operation in September, 1894, the lines from the Louvre to St. Cloud, etc., in August, 1895.

The total length of these lines is 30½ miles, the longest line being from the Louvre to Versailles, 11½ miles. The heaviest grade on any one of these lines is 4 1/3 per cent., which, however, is very short. On the St. Augustin-Vincennes line the heaviest grade returning to Paris is three per cent. for a distance of 660 ft., this being the longest of these heavy grades.

The compressing machinery for the three lines, starting from the Louvre, is supplied by nine boilers and eight vertical compound engines, the plant being rated at 1,320 h. p. The compressors are on the Mékarski system, run directly by the engines, and work in three stages and the air is compressed ultimately to 1,138 lbs. per sq. in. (80 kilograms per square centimeter).

In the first two cylinders the air is cooled by injecting water as the air is taken in. Besides that, between the compressors the current of air and water passes through chambers where the mixture is further cooled. Finally, the compressors are cooled by a continuous external circulation of water.

When the air is compressed it passes through a drying reservoir where the entrained water is given up, and then it goes to the storage. The plant can supply continuously 6,468 lbs. of air an hour at a pressure of 1,138 lbs. per sq. in.

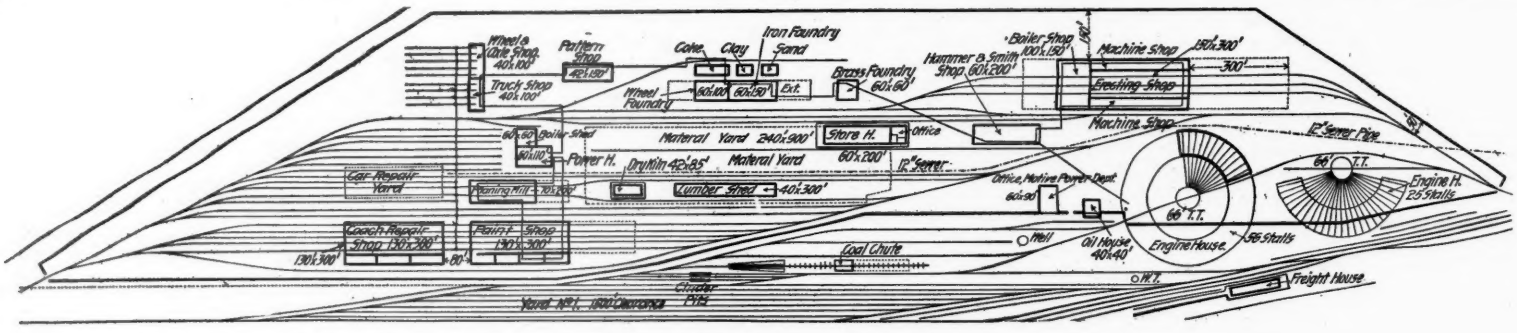
These lines (the three lines running from the Louvre) are worked by locomotives which weigh in working order 18 metric tons. They have six coupled wheels, the connection from the cylinders being to the first pair of drivers. Each of these locomotives has eight cylinders for the air, five of which are in a working battery and three in reserve. These cylinders hold in all 1,166 lbs. of air at 1,138 lbs. in a volume of 18.6 cu. ft.

When the air is taken from the cylinders it passes through a tank of water raised to a temperature of 230 deg. F. Each locomotive has two of these tanks, one holding about 10.5 cu. ft. for the working battery, the second 6.2 cu. ft. for the reserve. These are under the floor of the locomotive. A regulating valve reduces the pressure of the air before it enters the working cylinders to anything from 0 to 199 lbs. per sq. in., according to the profile of the road. The locomotive has a platform at either end with complete arrangements for working, so that the locomotive does not have to be turned.

The water in the tanks is heated by steam put in at a pressure of 128 lbs. per sq. in., and we observe that one of these reheating stations has three Babcock & Wilcox tubular boilers; the other has two Belleville boilers.

The engines of these locomotives are quite similar to those of a steam locomotive. Each has two cylinders placed outside the frame coupled directly to the drivers, and each motor can develop 25 h. p. The Walschaert valve gear is used. The locomotives are fitted with compressed air brakes, hand brakes and sanders.

The cars hauled have each 51 seats and weigh about eight metric tons when loaded. On week days there is a half-hourly service, each locomotive start-



The Mexican Central Repair Shops at Aguas Calientes.

ing from the Louvre with three cars, which trains are broken up as they diverge to the different points. Sundays each locomotive hauls four cars, giving 204 seats.

The service is very regular and it is only very seldom that there are difficulties in getting to the end of the run. Occasionally these happen because of bad track (dust or mud) or because of very cold weather, lowering the temperature of the water in the reheating tanks. The commercial speed is from 6.8 to 7.8 miles an hour. The actual speed of 12.4 miles is easily reached.

In 1890 the number of passengers carried on these lines was 4,784,000, which remained practically constant until 1895; then, after the change to compressed air working, the number of passengers carried rose immediately to 7,420,000 in 1896 and to 8,354,000 in 1898. In spite of this important traffic the lines are worked at a loss to the company because of the heavy sinking fund charges that have to be paid.

The line from St. Augustin to Vincennes is worked by motor cars, each having 50 seats and weighing 15 tons. Each one has a forward platform for the motorman and a rear platform for passengers, and consequently must be turned at each end of the run. Each has a reheating tank placed on the platform by the motorman and carries air cylinders with a total valume of 8.8 cu. ft. The working cylinders are essentially the same as those of the locomotives, but there are only four wheels instead of six. Each of these motor cars hauls a trailer with 50 seats, making a total capacity of 100 seats for the train.

These motors are charged not only at the terminus at Vincennes, but once on the route, this recharging on the route occupying three minutes. Only 1½ minutes need be taken for the air, but three minutes is necessary for the steam.

In 1894 the passengers carried on this line numbered 1,024,000; in 1895 the traffic had risen to 4,767,000 passengers, and 1898 to 7,681,000. Formerly the line was worked at a loss; now it yields a profit.

New Tie Treating Plant of the Burlington & Missouri River Railroad.

The new tie treating plant of the Burlington & Missouri River Railroad in Nebraska, at Edgemont, S. D., a junction point, has been in operation since the middle of November and since then an average of 50,000 ties a month has been treated. The plant was designed by Rowe & Rowe, Consulting Engineers, Chicago, who also superintended the erection. The ties treated are mountain pine, cut in the Black Hills, and Oregon fir; about half are sawed and half are hewed ties, varying in size from 2½ to 4 cu. ft. of timber.

The zinc-chloride process has been adopted as the ties will be used in dry regions where the zinc is not very liable to be washed out by the rains, and it is the same process as used by the Southern Pacific under similar climatic conditions. It is now well known that this process does not meet requirements where ties are subjected to heavy rains and subsequent rapid evaporation under a hot sun. Under such conditions injections of glue and tannin are necessary to prevent the leaching out of the mineral salts. However, the output of a given plant injecting zinc-chloride only is from one-third to one-fourth greater than when ties are treated with glue and tannin after the zinc-chloride treatment.

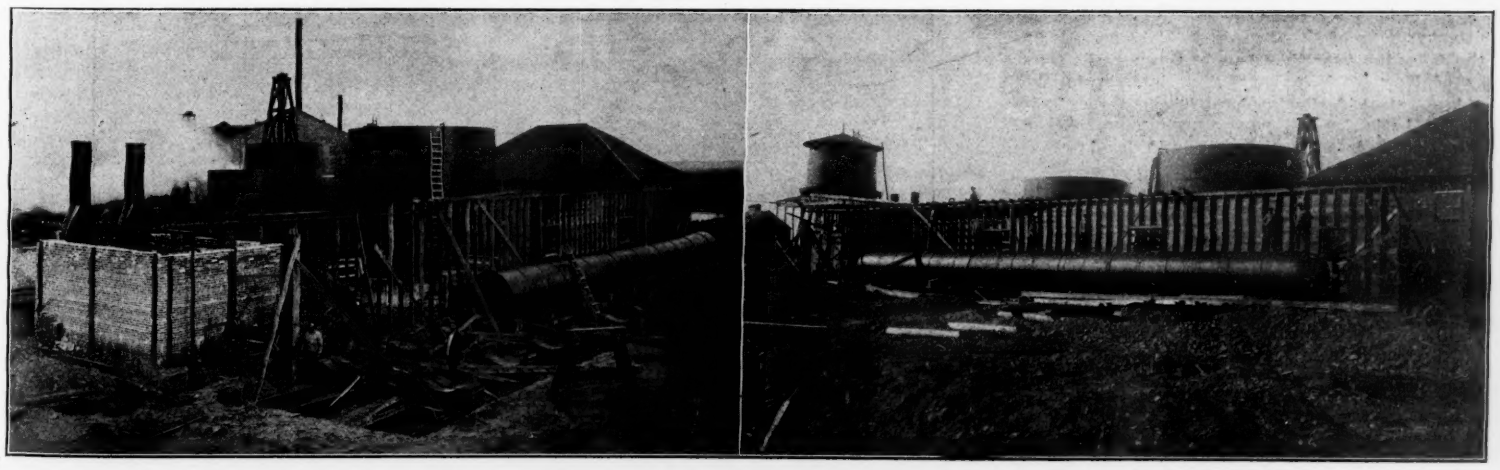
In the Edgemont plant, two cylindrical retorts are used, each 112 ft. long and 6 ft. in diameter, and made of ⅝-in. steel plates. Each retort will hold 13 tram cars and an average charge consists of 525 sawed ties, or 390 hewed ties. It is considered very good work if three runs are made with each retort in 24 hours.

Ties coming to the treating works are piled on the ground alongside the unloading tracks and as required are put on small tram cars which run on tracks leading to the retorts. After treatment the small cars are run on a long elevated platform and unloaded, from which the ties can easily be placed on cars for shipment.

In treating the ties, loaded tram cars are run into a retort, the doors are closed and then steam is let into the retort and a pressure of 20 lbs. maintained for from two to five hours, depending upon how green the timber may be. The corresponding temperature is about 250 deg. F., and this operation is to heat the wood thoroughly. A vacuum of 25 in. is then maintained in the retort for about 45 minutes to extract the sap, when a solution of chloride of zinc is let in and a pressure of 100 lbs. maintained for from 1½ to 2 hours, completing the treatment. The remaining solution is returned to the storage tank to be used again. An average of one pound of pure chloride of zinc is injected per tie, or one-third pound per cubic foot of timber, the amount used being determined by the measuring gage on the tank after the retort is filled and again at the end of the process when the remaining solution has been returned to the tank. The ties are not weighed to check this determination, as has been done at the portable plant at Mt. Vernon, Ill. The month and year of treatment are stamped in the end of each tie with steel hammers.

The boiler at this plant is of 200 horse power and there are two small pressure pumps, one vacuum pump, one air compressor and one fire service pump, in addition to the pump used for feeding the boiler. There is also an engine and generator for electric lighting purposes which is quite essential, as the works are operated both day and night. In this way the only fires about the plant are those under the boilers. Of the three tanks shown in the engravings, the largest is used for the zinc-chloride solution, the next in size is a storage tank for water and the smallest tank holds hot feed water for the boilers. The water used about the plant is obtained from artesian wells.

The first cost of the works was approximately $50,000. The ties treated cost about 45 cents each and the cost of the treatment is from 12 to 15 cents additional, the figures for treating not including interest on the investment or depreciation. It is expected that the treatment will increase the life of the ties about three times.



During Erection. *Showing Retort.*

Edgemont Tie Treating Plants—Burlington & Missouri River RR.

Physical Tests of Some Pacific Coast Timbers.*

Our Pacific Coast region is peculiarly lacking in hardwood trees, which are, at the same time, suitable for timber, and numerous enough to be of commercial importance. But of the soft-wood trees we have an abundance, the wealth of our coast in these woods being renowned the world over. In this region we have sixty species of coniferae. In fact, nine-tenths of all the trees on the Pacific Coast are cone-bearers.

Douglas Spruce.

Most prominent among our timber-trees is the Douglas spruce (Pseudotsuga taxifolia), discovered by David Douglas, of Scotland, in 1825, on the Columbia River. This most useful tree is grandly imposing in appearing, widely known, and extensively applied in the constructive arts, and has, perhaps, received more names than any other tree so recently discovered. It has been called, in different times and places, Douglas fir, Douglas spruce, yellow fir, or red fir, according to its color; and, by lumbermen and builders, Oregon pine, Puget Sound pine, etc.

It constitutes vast forests in the Puget Sound region, as well as in Washington and Oregon. Along those coasts it grows very tall and slender, sometimes attaining a height of 400 feet; but, in the interior and in open groves, it is usually shorter and stouter, being sometimes 10 or 12 feet in diameter at the butt. This tree is the most important and valuable, commercially, of all the northwestern conifers.

Our tests of timber from Douglas spruce, as made in the civil engineering laboratory of the University of California, at Berkeley, prove it to be a strong and durable wood, comparing most favorably with the pines of other countries. Its resistance to tension, compression and cross-breaking is very high; its only weak points seem to be in the matter of shearing along the grain of the wood, and in splitting. In construction, therefore, as little splitting, or shearing-strain along the grain, should be brought to bear as is practicable. The long, straight fibers in this timber serve admirably, like steel wires, to resist being torn apart longitudinally, and, as columns, in compression, to resist crushing; but they seem to have comparatively little lateral adhesion, as they slip past one another, or split apart, under small stress.

Some numerical results of tests in our laboratory are recorded below:

Average specific gravity of 20 specimens	0.592
Average weight per cubic foot of 20 specimens	36.99 lbs.
Percentage of moisture in 16 specimens	16.35
Modulus of strength at elastic limit, 21 specimens	6,938
Modulus of strength at rupture, 21 specimens	9,334
Modulus of elasticity, 21 specimens	1,862,947
Ultimate strength: Tension, 63 specimens	14,388
Compression, 59 specimens	5,556
Compression across fiber, reduction in height of piece of 3 per cent., 83 specimens	879
Compression across fiber, reduction in height of piece of 15 per cent., 83 specimens	1,215
Longitudinal shear, 85 specimens	546

*By Prof. Frank Soulé, University of California, Berkeley, Cal., at the California meeting of the Institute of Mining Engineers.

California Redwood.

California enjoys the distinction of being the only home of this magnificent forest tree, the Sequoia sempervirens. This first cousin to the Sequoia gigantea, and with which it may be compared in height, size and grandeur, is found only on the slopes of the Coast Range in California, from Monterey as far north as Oregon. The growth of redwood is often very dense, as many as 25,000,000 ft. B. M. having been cut, in earlier times, from 160 acres of land. Such forests often contain specimens from 200 to 325 ft. in height, the trunks having a diameter of from 5 to 25 ft. One of these giant redwood trunks, near Bucksport, yielded, a few years since, 480,000 ft. B. M. of first-class lumber, and many other trees have yielded 400,000. The average cut for a redwood forest is not far from 40,000 ft. B. M. per acre. This species is very tenacious of life, and will sprout from a damaged trunk or stump, or from the seed, under the most discouraging conditions. Given a fair chance, it quickly re-forests denuded areas.

Redwood timber is light, fairly strong, and very easy to work and shape. It resist decay well, even when buried in the soil. It does not ignite and burn readily. It shrinks greatly in the direction of the length of the fiber, in seasoning. These fibers are rather brittle in character, as compared with those of Douglas spruce, so that its strength in columns and girders is very inferior to that of the latter timber. I broke, some time since, in our Olsen testing-machine, two redwood beams, which were 5 in. broad, 16 in. deep, and 18 ft. between points of support. The stress was applied perpendicularly to the middle of the beam in each case. The first beam, which was very green and wet, yielded on the crushing-side at 18,400 pounds; and the second beam, which was much drier, yielded, in the same way, 25,600 pounds.

Average specific gravity of 126 pieces	0.48
Average weight per cubic foot	29.91 lbs.
Percentage of moisture, average	15
Modulus of strength at elastic limit, 5 specimens	3,557
Modulus of strength at rupture, 9 specimens	4,920
Modulus of elasticity, 8 specimens	797,460
Ultimate strength: Tension, 27 specimens	6,596
Compression, 29 specimens	4,407
Compression across fiber, reduction in height of piece of 3 per cent., 30 specimens	967
Compression across fiber, reduction in height of piece of 15 per cent., 30 specimens	1,200
Longitudinal shear, 10 specimens	505

The Greater Seaboard Air Line System.

More than a year ago the first steps were taken to bring about the consolidation of several railroads into a system to be known as the "Greater Seaboard Air Line." When the plans are carried through, it is proposed to include in a single system over 2,500 miles of railroad, extending from Richmond, Va., and Norfolk, in a direct line to Tampa and other Florida points. It will also tap on the east the seaport cities of Wilmington, Charleston, Savannah, Fernandina and Jacksonville. On the west it will extend to Chattahoochee, Montgomery, Atlanta and perhaps to Chattanooga, Tenn., and Birmingham, Ala. With the connecting lines, extensions and improvements building and yet to be built, the entire system will comprise a property whose capital stock will be $75,000,000, and funded debt $62,500,000.

In the fall of 1898, a syndicate headed by John L. Williams & Sons of Richmond, Va., and Middendorf, Oliver & Co. of Boston, bought a controlling interest in the Seaboard Air Line. These persons were already principal owners of the Georgia & Alabama. Early in the following year they bought through the Cuttings of New York, a controlling interest in the Florida Central & Peninsular. These three lines form the basis for the new consolidation. When taken over their mileage, stock and bonds were substantially as follows:

	Mileage.	Stock.	Bonds.
Seaboard Air Line	951.3	$7,258,650	$14,160,000
Georgia & Alabama	457.8	9,350,000	5,405,000
Florida Central & Peninsular	941.3	24,500,000	9,820,000
Total	2,350.4	$41,108,650	$29,385,000

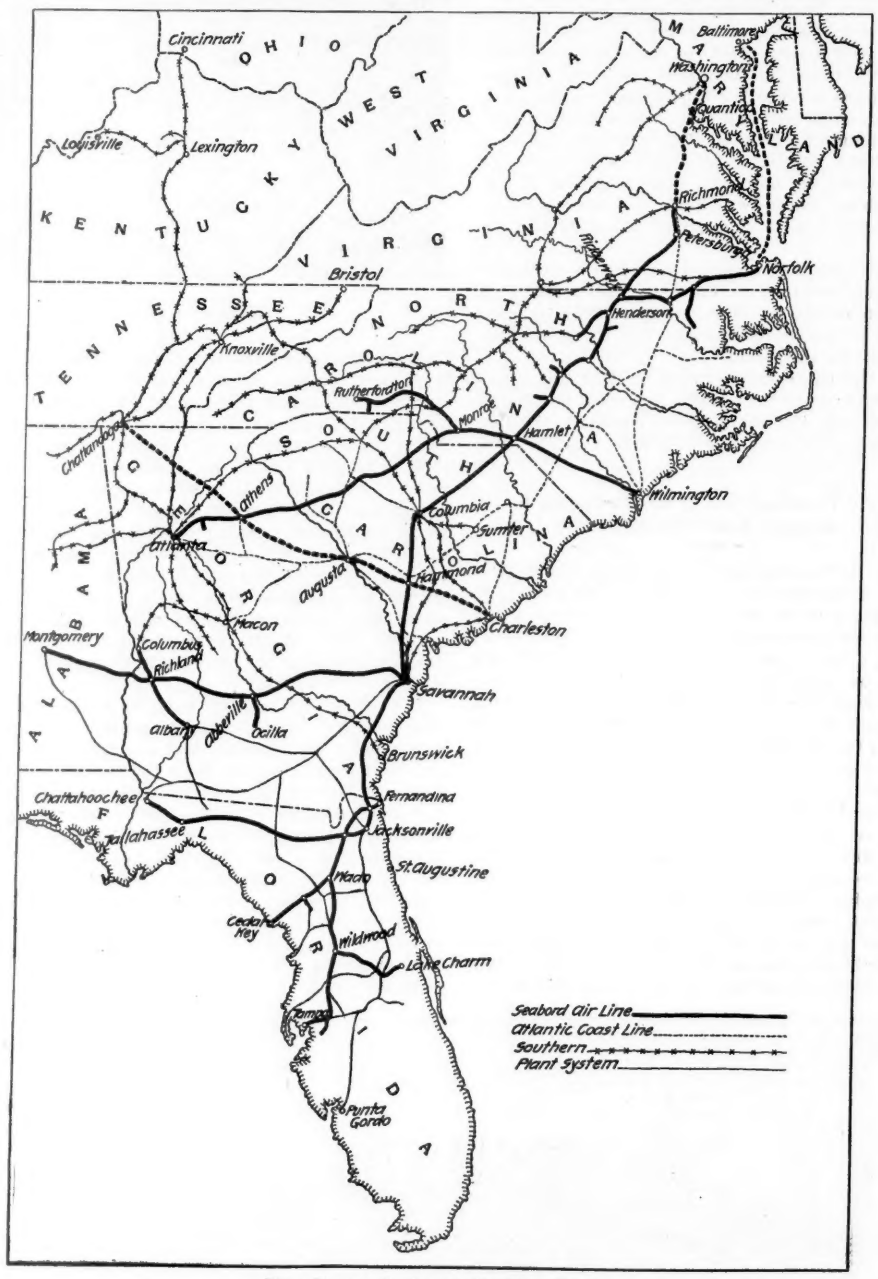
There were a number of gaps in the connections of the three systems. Work was begun at once to close these and it was expected that this would be done by the first of January last, but numerous difficulties have compelled delays. The point furthest north on the Florida Central & Peninsular was the city of Columbia, S. C. A connecting link northeast to Cheraw, about 90 miles, is now nearly completed. This joins the main line with the old Seaboard Air Line and carries it north to Ridgeway, N. C. Even before the consolidation of the three companies, a railroad had been begun from Ridgeway, to run north about 103 miles via Petersburg, Va., to Richmond, under the title of the Richmond, Petersburg & Carolina. About 20 miles of this was completed in 1898, and track was laid as far as Petersburg before Jan. 1 last. It is said to be only a question of a few days when the road will be completed to Richmond.

From Richmond northward the plan was to use the Richmond, Fredericksburg & Potomac to Quantico and the Pennsylvania to Washington. Last October John Skelton Williams, the new President of the Seaboard Air Line, was quoted as saying that negotiations had been concluded for this arrangement into Washington, giving the company the same rights as those enjoyed by the Atlantic Coast Line. From Washington the company was to have its trains run to New York over the Pennsylvania. Recently a charter was granted by the Virginia Legislature under the title of the Washington & Richmond Air Line for a road to parallel the Richmond, Fredericksburg & Potomac from Richmond north about 80 miles to Quantico, Va. As the new road would also parallel the Pennsylvania road from Quantico into Washington, 42 miles, it would also seem that some other arrangements were possible for an outlet to New York City. President Williams has recently said that it is the purpose of the Seaboard System, in the event of the building of the extension to Washington, to connect with both the Pennsylvania and the Baltimore & Ohio, securing two outlets to the north, northeast and northwest.

In addition to the necessary connecting links, the Georgia & Alabama has built its own line between Savannah and Meldrim, about 17 miles. This takes the place of the trackage rights on the Central of Georgia. Under the title of the Chattanooga, Augusta & Charleston Air Line a road has been incorporated by men connected with the Seaboard Air Line syndicate, to build from Charleston, S. C., northwest via Hammond, S. C., Augusta and Athens, Ga., to Chattanooga, Tenn. The road would connect with the Florida Central & Peninsular at Hammond, and with the old Seaboard Air Line at Athens. Surveys have been made for the section from Charleston to Augusta, about 125 miles, and also for the section from Augusta to Athens, about 100 miles. A decision is not yet reached as to the building.

The authorized stock for the completed system is placed at $75,000,000, at the rate of about $8,000 common, and $7,000 preferred on each mile. It is also proposed to issue $62,500,000 of 4 per cent. consolidated mortgage bonds covering the entire system. Of this $15,000,000 is to be reserved for extensions and improvements. It is semi-officially stated that the entire bonded debt will average only $18,000 per mile. This, with $15,000 per mile of stock, will bring the total securities up to $33,000 per mile. A further statement is that the actual earnings of all the roads proposed to be included, but now operated separately for the last calendar year, were sufficient to pay all rentals and interest in full on the present bonded debt and leave a surplus of about $1,000,000.

Should the Williams syndicate accomplish its ends, there will result a new railroad system into the South Atlantic States. Heretofore the only general systems of roads into this territory were the Southern and the Atlantic Coast Line. When the Florida Central & Peninsular changed hands, the Southern found it necessary to establish a new outlet, as its line extended only so far as Columbia, S. C. But by the purchase of the Carolina Midland, the building of a connecting link from Columbia to Perry, and the use of the Atlantic Coast Line and the Plant System for trackage, it now reaches Savannah. Of the three systems, the Southern stands at the head, with a total mileage owned and operated of about 6,600 miles; besides 1,100 miles more of which much of the capital stock is owned but is operated separately. The Atlantic Coast Line will stand third in the list, with 2,250 miles of road.



The Greater Seaboard Air Line System.

Freight Train Speeds.

As some further contribution to the discussion on economical freight train speeds, we print the following extracts from letters received from time to time. They carry their own evidence as being from men who are in the thick of responsible work.

I have recently again read Prof. Raymond's article on "Economical Freight Train Speeds [Jan. 26, p. 49]. I think it is very good, but almost everybody loses sight in the discussion of this matter of some of the practical facts in connection. When a freight train is scheduled to run over a division at 20 miles an hour, the chances are that a large part of the time it must run at 40 miles to make running time. This is especially true of single track roads, which are of course the rule, except on main trunk lines between the Mississippi River and New York. I have occasion to ride on freight trains and freight engines a good deal, and I notice the high speed

which freight trains make and have to make in order to keep up to the schedule, which on paper does not look very fast. This is measurably true of passenger trains. Heavy passenger trains are frequently scheduled to make important stops with no allowance at all for dead time, whereas the dead time actually consumed runs up frequently to eight and ten minutes. With freight trains there are many incidental delays, even on the best regulated roads, and delays at meeting and passing points are of course considerable.

I have read the article and see nothing illogical in it from the premises, but the author is evidently under a misapprehension as to the actual speeds necessary with trains carded at the speeds quoted from Mr. Herr's paper before the Western Railway Club, for while the carded time is correctly quoted at from 13 to 17 and 18 miles an hour, this figure is by no means the average running time, as the Northern Pacific is a single track road over the divisions referred to with, on some divisions, considerable switching delays at stations besides delay incident to meeting-points, taking water, getting orders, etc. All these tend to raise the actual average running time very much higher than the carded time.

The point I would make is that there is more room for reduction of speed of trains, before the speed below which there is no advantage in weight of train hauled is reached, than the figures shown in the paper and the comments thereon would seem to indicate.

I have been very much interested in reading this paper, and would be very glad indeed to give you any information I have on the question, but as a matter of fact we have very little. Such information is hard to get, and, as Prof. Raymond points out in his paper, each division of each road will have its most economical speed for both directions, so that definite information will not be of general use after all.

One of our division superintendents went into the matter quite carefully some time ago, and the results of his investigation seem to indicate that the increase in speed of certain trains over certain divisions increases the cost of operation, though the increase in cost of operation was not in proportion to the increase in speed. As I remember it, he took into consideration the actual increase in coal consumed, the wages of the engine and train crew, and as much other data as it was possible to cover. I cannot give his exact figures now, but I think the increase in speed was about 30%, the lower speed being about 17 miles, while the increase in cost of operation was between 20 and 25 per cent.

The Improved Susemihl Roller Side Bearing.

It is well known that the Michigan Central is one of the few roads that has used roller side bearings on cars to any considerable extent or that has obtained satisfactory results in service. At the present time all the passenger cars of that road are fitted with roller side bearings designed by Mr. F. G. Susemihl, the Architect and Mechanical Engineer of the Michigan Central, and the first of these were used more than ten years ago. While the details of the original design have been improved from time to time, the principle of the Susemihl bearing has remained unchanged; that is, by the use of a guiding lever the rollers are compelled to move with every movement of the bolsters. Until quite recently this guiding lever has been vertical in all the designs, requiring so much space between the bolsters that the bearing could only be used with passenger cars, and a few special freight cars; where the vertical guiding lever was adapted to the limited space between the bolsters of ordinary freight cars the construction became quite complicated. The arrangement, however, shown by the accompanying engravings has a lever in a horizontal position, making the bearing so compact that it occupies no more space than the common form of side bearing and can therefore be used on either passenger or freight equipment. In its present form the Susemihl roller bearing is being put on the market by the Simplex Railway Appliance Company, of Chicago.

Referring to the engravings, Fig. 1 shows the upper bearing lifted off and turned back when the roller carriage is in the central position, and Fig. 2 is a similar view with the rollers in the extreme position. A general view of the lower bearing is shown in Fig. 3. The more important details are shown by Fig. 4.

It will be seen that the upper bearing consists of a malleable iron casting, in the upper part of which is inserted a plate having a chilled face. This plate, which forms the upper bearing surface, is beveled to suit the rollers and held in place by two short bolts, the bolt heads being set into the plate. Two conical rollers, 3 in. long, are mounted in a malleable iron carriage and the carriage is held in the bearing socket by side flanges near the top. The rollers are let into the carriage from above and are held loosely in the frame by short gudgeons. The guiding lever passes through openings in the side of the carriage to which it is pivoted at the center, a 1-in. pin being put in from above when the carriage is in the central position. One end of the guiding lever engages projections on the lower bearing plate, as shown, and the opposite end engages similar projections on the upper bearing socket casting. The lower plate is of cast iron and the surface which comes in contact with the rollers is chilled, and beveled to suit the cone of the rollers. The rollers are cast iron and the guiding lever malleable iron. It will be seen that the lever is so proportioned that in case the bearings are not in contact, it causes the carriage to move a distance equal to the travel of the bolster. This positive movement takes the place of various centering devices in other roller side bearings.

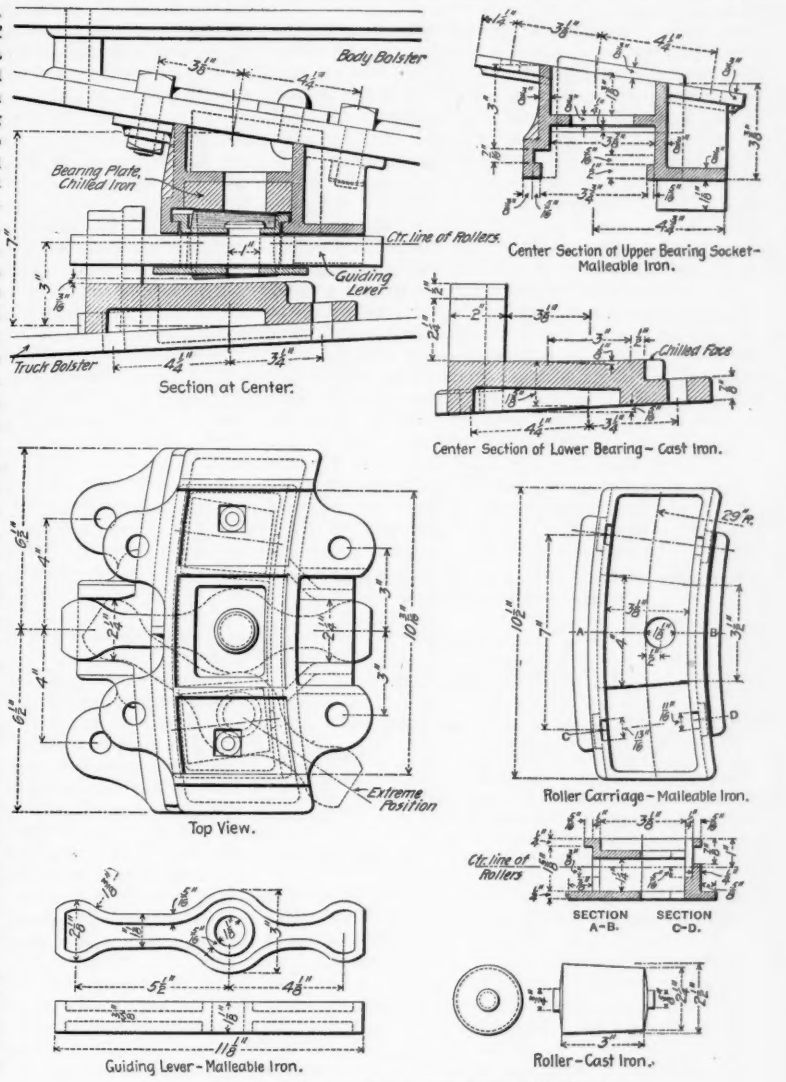


Fig. 4.—Details of Improved Susemihl Roller Side Bearing.

So far as the application to the bolsters is concerned, this bearing is attached in the same way as the ordinary plates and the car can be jacked up in the usual manner, as when in place the several parts of the upper bearing so interlock that they cannot become detached. To take the upper bearing apart it must be removed from the bolster and, with the carriage in the central position, the pin can be removed through the hole in the upper socket. This frees the guiding lever so that it can be withdrawn and then the carriage can be run out at the end and the rollers lifted out. There are but nine parts in the upper bearing, counting the two bolts that hold the upper bearing strip; the truck side bearing is a single casting.

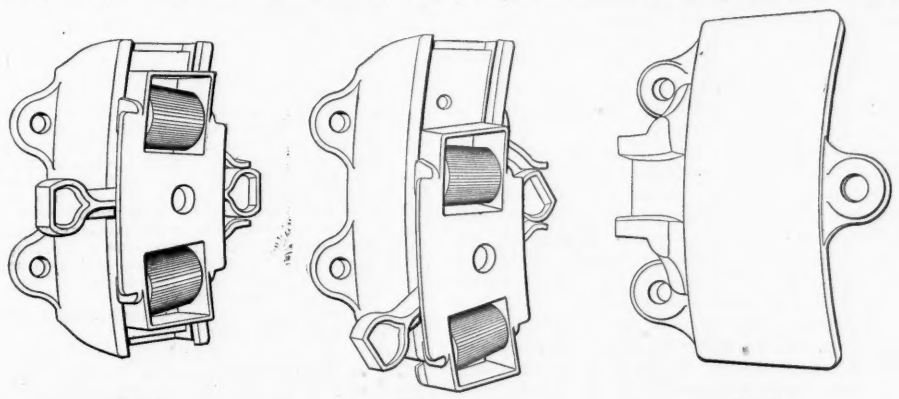


Fig. 1. Fig. 2. Fig. 3.

The experience of the Michigan Central with roller side bearings of this design indicates that the rollers do not wear out of round and that in passenger service the wear of the chilled bearing surfaces is about $\frac{1}{16}$ in. a year. The trouble common to most side bearings that have been tried, that the carriage does not move when the bolsters are out of contact, has been entirely overcome by the use of the guiding lever. Further, the parts are so enclosed that there is little chance of the rollers becoming inoperative through dirt and ice collecting about the carriage.

Handling of Small Consignments of Freight in England.

The question of handling and conveying broken loads of merchandise (Subject 22) is one of the topics for discussion at the coming session of the International Railway Congress, and a paper on the subject has been prepared by Mr. Charles Jesper, General Goods Manager of the North Eastern of England; it is printed in the January Bulletin of the Congress. The first point taken up is the handling of small packages in freight houses. Inquiries of the principal railroads elicit no report of any special arrangements, but at York an electrical overhead traveling crane, or something of the kind, for moving small packages, is to be tried, with a view to seeing if the method will be any cheaper than manual labor. The shipment of small consignments by freight is increasing in England. In Manchester it is estimated that 3,000 packages are sent out daily, which weigh not more than 56 lbs. each; in London the number probably is 10,000. "Carriers" who gathered small shipments to be sent in carload lots, thus making a profit, were common in England up to about 30 years ago, when the railroads gradually took the business of collecting and delivering into their own hands. Thirty years ago it was unusual for a railroad to both collect and deliver, but now it is an exception for the railroad not to perform this service. There still are, however, a number of parcel collecting companies doing business in England. The increasing prevalence of the practice of shipping goods in small lots is indicated by the small average freight carload. From data collected in 1895 it appeared that in one month on the North Eastern Railway, 4,040 cars were sent out with loads of less than one ton each; more than half of these cars contained less than half a ton each and nearly one-quarter contained less than 560 lbs.

Touching upon the question of car service on interchanged cars and sending foreign cars home empty, Mr. Jesper alludes to the fact that in South Africa cars are charged for at a certain rate per hour per axle.

The English roads have elaborate plans for sending cars regularly each day from each important town to all the other important towns with which regular traffic is done; and many freight car journeys have to be made through two, three or more junctions, so that this arrangement of cars is very extensive. Where freight in going from on sta-

tion to another has to be shifted, at a junction or elsewhere, from one car to another, it has been the universal practice to make a complete record of each shipment when the transfer was made, but this involved a large amount of clerical labor, and the North Eastern Company has abandoned the junction record, with no unfavorable results. More than half the checking clerks at large junctions have been assigned to other duties, and the change, when fully carried out, is expected to result in a saving of £2,000 to £3,000 a year.

Mr. Jesper discusses at considerable length the sending of freight on passenger trains. Mixed trains have been abolished, but freight is often sent on passenger trains when it is in a hurry, and Mr. Jesper thinks that this plan might be extended. A local freight might stop at, say, one-quarter of the stations, and then small packages for the other stations could be sent forward by passenger train. As everyone knows, the parcel business of the railroads—which we should call express business—constitutes a prominent part of the traffic on English railroads. Mr. Jesper presents a table showing that in many cases a shipper can get his freight carried on a passenger train at about the same price that is charged by freight, thus making a considerable saving in time; the only difference being that the passenger train charge does not include collection or delivery. Certain English roads are now calling at residences for baggage and delivering the same to the residences, the charge for this being very small. Mr. Jesper says that this low rate was made for the purpose of spreading the baggage traffic over a number of unimportant trains so as to avoid carrying it on the fast trains by which the owners travel.

The Work of Railroad Men on the Problem of Pure Water for Steam Boilers.

By C. Herschel Koyl.

III.—The State of the Art.

"Get, if possible, a supply of clean, soft natural water."
—The Committee.

"If a natural supply of soft water is not available, the only way to prevent incrustation and corrosion is to purify the water before it enters the boiler, and the accomplishment of this result will be the ne plus ultra of this important subject."—H. A. Towne.

"The only compound to put into a boiler is pure water."
—J. M. Boon.

These three quotations express very nearly the opinion of the original Committee of the Master Mechanics' Association, and it remains only to discuss the state of the art of water softening and purification as it exists in the year 1900 and as it has been hoped for by this Association during nearly 30 years.

The situation may be stated concisely by saying that it is now possible to convert almost any of the surface or deep well waters of the United States into boiler water which will neither scale, corrode nor foam, at a cost averaging about five cents per thousand gallons, including the cost of chemicals, of attendance and of interest on the price of the plant.

Almost everybody at all familiar with the subject knows that about 60 years ago Dr. Clarke, in England, made public his method of precipitating calcium and magnesium carbonates out of hard water by stealing from the water, by means of caustic lime, the extra quantity of carbonic acid gas (CO_2) which holds them in solution; that in the years since then the success of the plan has been abundantly proved; and that it is to-day being carried out in thousands of cases with entire satisfaction. By this means all the carbonate of calcium and magnesium is precipitated from the water, excepting only about 2½ grains per U. S. gallon which remains dissolved as a monocarbonate and produces so little trouble that it is not worth bothering about.

The other substances dissolved in water which make it hard are principally sulphate and chloride of calcium and magnesium, and these with their allied compounds may be taken out by adding a proper amount of sodium carbonate. The action of the dissolved sodium carbonate upon the dissolved sulphate or chloride of calcium or magnesium is to exchange acids, giving carbonate of calcium or magnesium, insoluble compounds which are immediately precipitated from the water, and sulphate or chloride of sodium, each a neutral, harmless, extremely soluble compound which is not precipitated by heat and requires only a little blowing out of the boiler to prevent concentration. Mud and other impurities, which are not dissolved in the water but are in suspension, are carried down by the precipitates formed from the calcium and magnesium compounds.

Fresh lime was always cheap, and since almost pure sodium carbonate has also become cheap and since the mechanical requirements have been worked out, the question is settled.

For many years after the chemical softening of water began, very crude mechanical methods and appliances were used, and it is only within the last 15 years that work of this character has been possible on a commercial scale. The precipitates formed by the calcium and magnesium settle so slowly that in the early days the water after treatment with chemicals was allowed to flow into shallow settling basins of great area, so that the precipitates had only a few inches to fall; and even now, in some places in Europe and in this country there are used large tanks in pairs into which the treated water is run alternately and is allowed to settle for 10 or 12 hours in one while the clear water is being used from the other.

But the work of water softening began to be an art only when some one suggested that a small tank might be fitted with inclined shelves parallel to each other, the spaces between which should form a series of shallow settling basins, so that water might be allowed to flow in a steady stream through such a tank for the space of say two hours during which its precipitates would be all settled out and the water be ready for use. By the skillful application of this plan the time necessary for the chemical action and for the settling of the precipitates from the water is now seldom in excess of two hours, and is generally less.

The only other mechanical requirement for successful commercial work of this kind was an application of well known methods of regulating automatically the inflow of hard water by the outflow of soft water, and the regulation of the supply of lime and soda to correspond.

Now-a-days a water softening machine worthy of the name is continuous in its action; regulates automatically the supply of raw water so as to keep it always equal to the amount of soft water being used; regulates automatically the supply of lime and soda to the raw water; makes the settling so complete that the machine need not be complicated with filters; requires no further attention than the few minutes necessary daily to renew the supplies of lime and soda, and the few seconds necessary daily to discharge the accumulated precipitates from the bottom of the settling tank; and is able to treat almost any water found in the United States at a cost of a few cents per thousand gallons, and without the aid of heat.

The operation of a modern plant of this kind is as nearly automatic as the operation of a steam engine. Turn on a continuous supply of raw water at the inlet pipe, furnish the reagent boxes with regular amounts of lime and soda daily and the trick is done. The continuous stream of water flowing from one of these machines is not only soft but free from suspended matter, and is ready for immediate use in the boiler. The 2½ grains per U. S. gallon of scale-forming matter is generally monocarbonate of calcium; but if the water has been properly treated this small amount of material is precipitated within the boiler, not in a hard scale but as a soft sludge, and if each boiler is fitted with such a blow-off apparatus as is recommended by the Master Mechanics' Association and shown in my second paper, this soft sludge, together with the chloride and sulphate of sodium is easily blown out, so that the boiler is kept absolutely clean with the loss of less than 1 per cent. of the amount of water fed to the boiler.

It is important that everyone should know that the treatment of each individual water is a problem by itself. The amount of lime must be strictly proportioned to the amount of carbonic acid gas (CO_2) free or loosely combined in the water, for if too much lime is used the water may easily be made more hard than in its original state. The amount of soda should also be strictly proportioned to the amount of scale-forming matter which it is to take out.

The alkaline waters of the west, and the acid waters of the mining regions, present no more difficulty than ordinary hard water.

In England, progress in this matter has reached such a stage that for eight or nine years there have been in use a continuously increasing number of plants regularly engaged in the softening of water for locomotive boilers, for stationary boilers, and for general industrial purposes. In France the progress of invention has been nearly parallel to that in England, and there are now in use in that country probably 1,000 machines of capacity varying from 1,000 gallons to 500,000 gallons a day.

Other countries are far behind England and France in this matter because in most of them the water, from various geological and topographical causes, is much more difficult to treat; but the number of water softening plants in Germany, Russia and the United States and elsewhere is increasing daily, and the apparatus now for sale in the United States leads the world in value and efficiency.

The art of water softening and purification, in competent hands, has reached almost the final stage of perfection and cheapness. Fresh lime and soda carbonate are the most efficient chemicals for the purpose, as they are also the cheapest, and no one need waste time trying to get anything better or anything cheaper.

The price at which these water softening apparatus are sold in the markets of the world is such that the interest on the investment makes a charge of about one-half cent per thousand gallons of water used; this charge, the cost of attendance and the cost of lime and soda make the average cost of softening and cleansing water not more than five cents per thousand gallons. Such water is then much cheaper than ordinary city water, and also much better.

When I think of the saving in expense and of the improvement in locomotive service which will be effected by keeping every railroad water tank in the United States filled with clean soft water, I can but recall the unflagging industry, the broad investigation, the logical conclusion, the altogether classic work of the Committee of the early '70s. I have never seen a member of that Committee; I know not their methods of address; but if the words of the Chairman of the Committee rang out from the platform in those days as they ring out now from the printed page, I cannot believe that any man interested in locomotive work who then heard them can ever forget them. "Halt not with half measures. Go forward until every locomotive is supplied with pure water. This is the final stopping place, and this should be the first stopping place." Such was the burden of the charge. It reads like the call of Demosthenes to the troubled but fighting Greeks.

If any man needs inspiration this summer, let him get copies of the reports of the American Railway Master Mechanics' Association for the years 1870 to 1875.

Train Accidents in the United States in February.

COLLISIONS.

Rear.

5th, on Hocking Valley road, at Carey, O., a passenger train ran into the rear of a preceding freight, wrecking the engine, caboose, two freight cars and one express car. The wreck took fire and was mostly burned up. A brakeman was killed and two trainmen and one passenger were injured.

5th, on Lehigh Valley, near Wilkesbarre, Pa., a freight train descending a grade broke in two and the rear portion afterward ran into the forward one, wrecking several cars. A boy stealing a ride was killed. One report states that tramps ridings on the cars deliberately uncoupled some of the rear cars from the front portion of the train, with a view to stopping them so that it would be safe to get off.

8th, 7 p. m., on Chicago & Northwestern, at Ford River, Mich., a freight train ran into the rear of a preceding passenger train which consisted of one passenger car and one baggage car. Both of these were wrecked and nearly all of the passengers were either killed or injured. Ten passengers and two trainmen were killed and three passengers and three trainmen were injured. There was a blinding snowstorm at the time. The wreck took fire and a part of it was consumed; some of the injured passengers were badly burned.

15th, 9 p. m., on Lake Shore & Michigan Southern, at Swanton, Ind., a freight train drawn by two engines ran into the rear of a preceding freight, wrecking both engines. Three trainmen were injured.

17th, on Gulf, Colorado & Santa Fe, near Valley Mills, Tex., a freight train ran into the rear of a preceding freight, badly damaging caboose, engine and several cars; three trainmen injured.

18th, on Texas & Pacific, at Waggaman, La., a passenger train ran over a misplaced switch and into the rear of a freight train standing on the side track, damaging the engine and several freight cars; two trainmen injured.

21st, on Baltimore & Ohio, at Edgemore, Ind., a milk train ran into the rear of a preceding passenger train (No. 5), badly damaging the engine and several cars. One engineman, one fireman and the steward of the dining car were injured. The conductor of the milk train was made insane by an injury to his head.

24th, on Baltimore & Ohio, near Rawlings, Md., rear collision of freight trains, wrecking several cars. The wreck took fire and most of it was burned up. A brakeman injured.

24th, on Kansas City, Pittsburgh & Gulf, near Jansen, Ark., a passenger train ran into the rear of a preceding freight; three trainmen injured.

25th, on Delaware, Lackawanna & Western, near Alden, N. Y., rear collision of freight trains, damaging the caboose. The conductor was killed.

26th, on Baltimore & Ohio, at Green Spring, W. Va., passenger train No. 10 collided with a freight train and both engines and several cars were wrecked. Two trainmen and one passenger were injured.

27th, on Chicago, Lake Shore & Western, at South Chicago, Ill., collision of freight trains, wrecking a caboose, which took fire and was burned up. The conductor was burned to death, and two other trainmen were injured.

27th, on Pittsburgh, Ft. Wayne & Chicago, at Mansfield, O., a freight train standing at the station was run into at the rear by a following freight, and the caboose and six cars were wrecked. The conductor was killed.

27th, 6 p. m., on Missouri Pacific, at Elm Park, Mo., passenger train No. 1, which had been stopped by a freight train ahead of it, which was delayed by snow, was run into at the rear by passenger train No. 5 and the rear car, a sleeper, was wrecked for half its length. The wreck took fire and was mostly burned up. Three passengers were killed, all of them women, and eight passengers and two employes were injured. There was a blinding snowstorm at the time of the collision and it is said that the engineman of No. 5 failed to see the signal shown by the flagman of No. 1.

And 23 others on 19 roads, involving 3 passenger and 33 freight and other trains.

Butting.

2nd, on New York Central & Hudson River, near Savannah, N. Y., collision of freight trains, wrecking both engines and six cars. Two trainmen were killed and two injured. It is said that this was a butting collision on single track, due to the fact that one of the enginemen was asleep.

5th, on Western New York & Pennsylvania, at Wanakah, N. Y., butting collision between southbound passenger train No. 16 and northbound passenger No. 11, badly damaging both engines. One engineman was killed and one fireman injured. It is said that the southbound train was on the side track and that the collision was due to a misplaced switch.

4th, on Philadelphia & Reading, near Mainville, Pa., butting collision of freight trains, badly damaging both engines and several cars. One trainman was injured.

6th, on Cincinnati, New Orleans & Texas Pacific,

at Burgin, Ky., collision of freight trains; one trainman killed.

7th, on Chicago, Milwaukee & St. Paul, at Donnan Junction, Ia., butting collision between a westbound passenger and an eastbound freight train. A fireman was killed and three passengers and two trainmen were injured. There was a dense fog at the time. It is said that the engineman of the passenger train misconstrued a meeting order.

7th, on Allegheny Valley, near Kittaning, Pa., butting collision between a northbound passenger and a southbound freight train, badly damaging both engines. Three trainmen were injured.

8th, 5 a. m., on New York Central & Hudson River, at Gorton Heights, Pa., butting collision of freight trains, both running at full speed, wrecking both engines and 22 cars. Both enginemen and one fireman were killed and four trainmen were injured. It is said that one of the trains ran past an appointed meeting place.

8th, on Illinois Central, at Leitchfield, Ky., butting collision between a northbound passenger train and a southbound freight, badly damaging both engines. One engineman and six pasengers were injured.

23rd, on Southern Railway, near Eupora, Miss., collision between a work train and a freight train, damaging both engines. Two employes were injured.

23rd, on Texas & Pacific, at Mineola, Tex., butting collision between a passenger train and a freight, due to a misplaced switch. One engineman and one fireman were injured.

24th, on Baltimore & Ohio, at Yough, Pa., butting collision of freight trains, making a bad wreck. A drover was killed. The wreck took fire and part of it was burned up, including many live cattle.

27th, on Pennsylvania road, near Nescopeck, Pa., butting collision between a passenger train and a freight, badly damaging both engines and several freight cars. The engineman and fireman of the passenger train were killed and several passengers were injured.

And 8 others on 7 roads, involving 2 passenger and 14 freight and other trains.

Crossing and Miscellaneous.

1st, on Erie road, at Akron, O., collision between eastbound express train No. 14 and westbound freight No. 77. One engineman was killed and one fireman injured.

3rd, at North Forty-fifth Avenue and Irving Park Boulevard, Chicago, a passenger train of the Chicago, Milwaukee & St. Paul was run into by a freight of the Chicago & Northwestern, at the crossing of the two roads, damaging the passenger engine and two cars in the freight train. Four passengers and three trainmen were injured. There was a blinding snowstorm at the time.

4th, on Pittsburgh & Lake Erie, at Montour Junction, Pa., a passenger train ran over a misplaced switch and collided with a switching engine. One trainman was injured.

6th, on Chicago & Alton, near Chicago, Ill., collision between a passenger train and a switching engine; one fireman injured. It is said that the collision was due to a misunderstanding of signals.

7th, on Wisconsin Central, at Franklin Park, Ill., collision of switching engines; two trainmen were killed and two others were injured.

9th, on Philadelphia & Reading, near Lawnton, Pa., a freight train ascending a grade broke in two and 12 cars ran back some distance to a string of freight cars which had been left standing on the main track; the ensuing collision damaged six or eight cars. A man stealing a ride was injured.

9th, on Alabama Midland, at Tharin, Ala., collision of freight trains, one of which was drawn by two engines. All three engines and several freight cars were wrecked. Two trainmen were injured.

11th, on Great Northern, near Barker, Mont., three cars became uncoupled from the rear of a freight train ascending a grade and ran back into a number of cars which had been left standing on the main track, making a bad wreck. A man working on one of the cars was fatally injured.

14th, on Northern Central, at Troy, Pa., a freight train switching on the main track was run into by passenger train No. 2, badly damaging the caboose, which took fire and, with one freight car, was burned up. The fireman jumped off and was injured and a brakeman was badly burned in trying to save some property in the caboose. While he was inside the burning caboose a can of oil exploded.

15th, at Forty-ninth Street and Stewart Avenue, Chicago, a freight train of the Chicago & Eastern Illinois ran into a freight of the Wabash road, wrecking the caboose. The conductor of the Wabash train was in the caboose and was badly burned.

20th, 5 a. m., on Southern Pacific, at Tracy, Cal., a sleeping car which was being transferred from one train to another was run into by a freight train and partly overturned. Two passengers were injured. It is said that as soon as the car was upset the fire in the heater in the sleeping car was extinguished by a "patent device" attached to the stove.

22nd, 4 a. m., on Philadelphia & Reading, at Locust Summit, Pa., collision between passenger train No. 11 and a switching engine, due to a misplaced switch. One trainman was killed and three were injured.

22nd, on New York Central & Hudson River, near Rochester, N. Y., collision of freight trains; three employes injured.

23rd, at Shippensburg, Pa., a freight train of the Philadelphia & Reading collided with a freight of the Western Maryland. One engineman was killed and the other was injured.

25th, on Delaware, Lackawanna & Western, near Cresco, Pa., a freight train which became uncontrollable on a steep grade collided with another freight train. One engineman was fatally injured.

27th, on St. Louis Southwestern, at Texarkana, Tex., collision of switching trains in the yard, wrecking an engine and two parlor cars. One trainman was injured.

28th, 4 a. m., on Boston & Maine, at Oakdale, Mass., collision between a freight train and a switching engine; five employes injured.

And 26 others on 19 roads, involving 4 passenger and 42 freight and other trains.

DERAILMENTS.

Defects of Roadway.

9th, on Millen & Southwestern, near Butts, Ga., a passenger train was derailed by a broken rail and two coaches fell down a bank and were badly damaged. Five passengers were injured.

23rd, on Cleveland, Cincinnati, Chicago & St. Louis, at Terre Haute, Ind., eastbound freight train No. 96 broke through the bridge over the Wabash River, which had been weakened by ice, and the engine and 38 cars fell into the river. The engineman, fireman and one brakeman were injured, two of them fatally. This wreck was described in the Railroad Gazette of March 2.

24th, on Central of New Jersey, near Miners' Mills, Pa., a freight train was derailed at a point where the roadbed had been undermined by the sinking of the roof of a coal mine beneath the track.

And 5 others on 5 roads, involving 3 passenger and 2 freight trains.

Defects of Equipment.

1st, 6 a. m., on Brooklyn Elevated, at Bridge Street, Brooklyn, N. Y., the electric motor car of a passenger train was derailed by the breaking of an axle.

9th, on Rockaway Valley road, at Washington Valley, N. J., a passenger train was derailed by the breaking of an axle of the tender; fireman injured.

11th, on Chicago, Rock Island & Texas, at Bridgeport, Tex., a freight train was derailed by a broken truck and eight cars were ditched. A brakeman was injured.

12th, on Nashville, Chattanooga & St. Louis, at Cowan, Tenn., the caboose of a freight train, which was being pushed by a following freight, was derailed by the breaking of the drawbar between the engine and caboose. A brakeman was injured.

21st, on Wisconsin Central, near Curtiss, Wis., passenger train No. 1 was derailed by a broken wheel and 17 passengers were injured, two of them fatally.

22nd, 4 a. m., on Buffalo, Rochester & Pittsburgh, near Eagle, N. Y., freight train No. 34 was derailed by a brakebeam which fell upon the track, and three cars were wrecked. The conductor was injured.

And 22 others on 18 roads, involving 4 passenger and 18 freight and other trains.

Negligence in Operating.

1st, 10 p. m., on Pittsburgh Junction road, near Thirty-second Street, Pittsburgh, a freight train was derailed at a misplaced switch and 13 cars were wrecked. The fireman was fatally injured.

7th, on Florence & Cripple Creek, at Glenbrook, Col., a freight train became uncontrollable on a descending grade and the engine and 11 cars were derailed. The fireman and one brakeman were killed and the conductor and engineman were injured.

7th, on Western New York & Pennsylvania, at Olean, N. Y., a freight train which, in switching, was not properly controlled, ran off the end of a spur track and knocked down a portion of the freight office. A clerk in the office was killed.

12th, on Brookville Railway, near Brookville, Pa., a freight train became uncontrollable on a steep grade and the engine and three cars were derailed and fell down a bank. The engineman was killed and three other trainmen were injured.

15th, 1 a. m., on Northern Pacific, near Helena, Mont., a long eastbound freight train became uncontrollable while running down a steep grade and 40 cars were derailed and ditched. The engine fell down the side of the mountain 200 ft. One brakeman was killed and one brakeman, the engineman and the fireman were injured.

22nd, on Chicago, Rock Island & Texas, near Kingfisher, I. T., a freight train was derailed at an unfastened switch and the engine and several cars were damaged. The fireman was killed and two other trainmen were injured.

23rd, on Gulf & Ship Island, at Howison, Miss., a freight train was derailed by a misplaced switch, and six cars were ditched. A man stealing a ride was killed.

25th, 3 a. m., on Louisville & Nashville, near Flomaton, Ala., passenger train No. 2 was derailed at a misplaced switch and both of the two engines drawing it were overturned, and the mair car was ditched. One fireman was killed and one engineman injured.

And 7 others on 7 roads, involving 3 passenger and 4 freight and other trains.

Unforeseen Obstructions.

4th, on Illinois Central, near Hudsonville, Miss., a freight train was derailed by running over a cow, and the engine and 10 cars broke through a trestle bridge. The fireman was injured.

6th, on Yazoo & Mississippi Valley, near Vicksburg, Miss., a freight train was derailed by a malicious obstruction and 12 cars were ditched. A brakeman was killed.

12th, 2 a. m., on Southern Railway, near Black Mountain, N. C., a freight train was derailed by a landslide and the engine was overturned. The fireman and one brakeman were killed.

13th, on Boston & Maine, near Quinapoxet, Mass., an eastbound passenger train was derailed at a washout and the engine and first two cars were wrecked. Five trainmen were injured.

16th, on Seaboard Air Line, near Clinton, S. C., a freight train was derailed by a washout and the fireman and one brakeman were killed.

23rd, on Pittsburgh, Cincinnati, Chicago & St. Louis, near Dinsmore, Pa., a westbound freight train was derailed by a landslide and several cars fell upon the eastbound track. A passenger train on this track came along a few moments after the derailment and its engine and forward car were wrecked. The baggage car took fire and was burned up and one passenger car and one freight car were damaged by fire. Three trainmen and four passengers were injured.

And 5 others on 4 roads, involving 2 passenger and 3 freight trains.

Unexplained.

1st, on New London Northern, near South Londonderry, Vt., a passenger car in a passenger train was derailed and fell down a bank. One passenger was injured.

8th, on Central of New Jersey, at Easton, Pa., a freight train was derailed and a brakeman was injured.

8th, on Central of Pennsylvania, near Zion, Pa., a locomotive running backward was derailed, and the engineman and fireman were injured.

9th, on Duluth, South Shore & Atlantic, at Nestoria, Mich., a passenger train was derailed and four coaches fell down a bank. Two passengers were injured.

14th, on Virginia & Southwestern, near Clinchport, Va., a freight train was derailed by a landslide and the engine and three cars fell down a bank. The fireman was injured.

16th, on Fort Worth & Denver, at Duncan, Tex., a freight train was derailed and two engines and 11 cars were ditched. A brakeman was injured.

19th, on Chicago, St. Paul, Minneapolis & Omaha, at Gordon, Wis., a passenger train was derailed and the engineman and fireman were injured.

23rd, on Texas Midland, near Terrell, Tex., a passenger train was derailed and three passengers were injured.

24th, on Southern Railway, near Taylorsville, Ky., a mixed train was derailed and two trainmen and four passengers were injured.

24th, 9 p. m., on Galveston, Houston & Northern, near Deepwater, Tex., a passenger train was derailed, and several cars were overturned. The baggageman was killed.

26th, on Buffalo & Susquehanna, near Sabinsville, Pa., an engine and a passenger car moving backward were derailed and fell down a bank. The engineman was injured.

And 48 others on 40 roads, involving 48 freight and other trains.

OTHER ACCIDENTS.

7th, on Boston & Maine, at Munroe, Mass., the locomotive of an eastbound local passenger train, which was running at low speed, was disabled by the breaking of the right rear driving axle, the wheel falling off. The engineman at once applied the brakes and brought the train to a stop within a short distance; but before the engine came to rest both driving wheels on the left side were broken off, in the same manner as the first. The engine was supported by the coupling by which it was attached to the tender, and after the broken parts were removed and the left side was disconnected, it was run under its own steam to Boston, 10 miles.

And 4 others on 4 roads, involving 2 passenger and 2 freight trains.

Snow Hedges for the Semi-Arid Plains.

Eleagnus angustifolia, or Russian olive, deserves to be placed first in the list of trees for snow hedges. It was brought to this country by the Russian Mennonites, who settled in Kansas and Nebraska since 1837, and has proven to be perfectly hardy in its new home, adapts itself to nearly all situations and soils, and transplants easily. The wood is hard and heavy; bark shining brown; leaves willow shape, dark green, glossy, silvery white underneath; flowers small, deep yellow, very fragrant and appear abundantly in May and June; fruit a small nut with a whitish downy covering, ripening in October. It is one of the prettiest lawn trees on account of its contrast with trees of heavier foliage.

Its value as a snow hedge consists in its adaptability to the most varying conditions of climate, remaining green when other trees become parched with drouth and hot winds, and coming out of the severest winters unhurt. It naturally grows bushlike and quickly makes a dense hedge, and, by trimming, a fine ornamental hedge.

Its value as a construction timber has not been fully tested, as it takes some time to prove its durability in the ground as a tie or post.

A. REINISCH,
Lawrence, Kan. Landscape Gardener.

Foreign Railroad Notes.

The President of France has issued a decree setting forth the constitution of the "Committee on Operation of Railroads." This committee is to consist of the director of railroads (Department of Public Works), the director of the state railroads, the directors of the control and management of railroads (members of the Right) and 22 members to be named by the Minister of Public Works. These last include one inspector-general of the Department of Roads and Bridges, or of Mines, four officers of the mining staff, four officers of the road and bridge staff and one representing the War Department; and 12 members chosen from among the most competent persons, of whom two shall be lawyers and three former employes of the state railroads, these three to be selected from the operating, the M. W. and the M. P. departments respectively.

This committee is to deal with concessionaries for railroads or tramways; it may be called upon to give its opinion on rules for working railroads, regulation of stations and grade crossings, maintenance of road and rolling stock, modifications in train service, and railroad accidents, inventions, and the application of laws to railroads. The committee will also consider the conditions under which foreigners may work railroads. It may, of its own motion, bring matters before the Minister.

The proposition for the state to acquire all of the railroads has been considerably discussed of late in France, and Chambers of Commerce of a number of cities have discussed the subject. It is said that in Nantes, Orleans, St. Nazaire, Bordeaux, Beauvais, L'Oise and Havre these discussions have resulted in decisions adverse to the proposition. Objection is made to the increase of the public debt and to the prospect of unfavorable financial results. Figures are published showing that in other countries on the continent the private railroads show a smaller ratio of expenses to receipts than do the state railroads. The number of persons employed by the state would be increased and the political results would be unfavorable. Economy and progress are found in private companies, not in those managed by the state. An efficient minister might be tempted away from the service by a higher portfolio. The legislative branch of the Government constantly tends to encroach upon the executive power and would thus interfere with the management of railroads.

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to improvements. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.*

At the meeting of the Iron and Steel Institute at Stockholm in 1898, Mr. C. P. Sandberg said: "I trust that at the coming congress in Paris in 1900 engineers will leave out the chemical composition in their specifications [for rails] and only demand an adequate tup test for safety, as well as a limited deflection to secure the required hardness, leaving out the tensile tests altogether." It is questionable if the engineers from the United States who take part in these various congresses at the Exposition in which this matter may come up, will approve of the notion of leaving out the chemical requirements. It seems like a return to the practice of the dark ages of steel making. It is quite possible that in years past more reliance has been placed upon chemical composition than is warranted. Engineers and rail makers have discovered that manipulation is quite as important as composition, possibly even more important; but care in both of these particulars is necessary if uniform, reliable and positive results are to be reached.

In our news columns, during the month of March, we noted orders for 9,932 cars of all kinds and for 380 locomotives. Of the cars ordered, 6,574 were box, stock, furniture and refrigerator cars; 1,756 were coal, ore and gondola cars; 800 were steel cars; 560 were flat cars; 5 were tank cars, and 237 were for passenger and street railroad service. Of the locomotives, 17 were for export, and the division of types was, approximately, 60 passenger, 307 freight and 10 switching locomotives. The number of locomotives ordered was more than twice the number ordered in February, bearing out our prediction of last month that the March record would show an increase. The car orders, however, instead of being larger than in February, fell about 600 below the record for that month. This is due to the postponement of one large order which was under consideration at the end of February. The outlook now seems to be that the coming month will not be remarkable for large orders and that new equipment orders will not be freely placed for the next few weeks, although a number of small orders are expected.

In the morning newspapers on Wednesday of this week the statement was made that "the Vanderbilts" had acquired control of the Reading Railroad, and, further, that the Lehigh Valley and the Erie are to be "merged into the Reading" and thus all become a part of the Vanderbilt properties. Precisely what has happened it is impossible for us yet to say, but we venture the guess that the story is three-fourths nonsense. It is quite possible that the Vanderbilt holding in Reading has been increased and there the story should probably stop. It is highly improbable that there will be any merging of the Erie and the Lehigh Valley. The Morgan interests are strong in both, and doubtless all of these properties will be worked in future with more harmony than in the past. Speaking generally, this latest change of ownership (whatever it may amount to) is a part of the series of operations going on by which the Trunk Lines reaching the Atlantic coast anywhere as far south as Newport News will be sufficiently controlled by a few strong owners to insure a reasonable and civilized harmony of operation. That is about all that anybody can say on the matter yet. Another step in the movement is noted in what we have to say in these columns this week on the matter of the Pennsylvania and the Norfolk & Western.

The fact that the Pennsylvania Railroad had acquired a considerable interest in the Norfolk & Western was noted in the Railroad Gazette last week. Mr. John P. Green, First Vice-President of the Pennsylvania, in giving to one of the daily papers the reasons why this purchase has been made, mentions as the first and most important one the favorable outlook for the export trade in bituminous coal. This is a more positive opinion on this point than we have before seen from a competent judge. Inquiries from Europe for coal have been common in New York and Philadelphia offices for several months, but the home demand has been so heavy that as a general thing the European orders have received scant attention, though considerable shipments have been made. Those who are best posted about the trade have continued to speak very conservatively about the prospect of building up a European market. Mr. Green, however, thinks that the prospect is "very bright." In the New River and Kanawha districts, on the Chesapeake & Ohio, and the Pocahontas district, on the Norfolk & Western, the coal is easily mined and is of fine quality. The two roads named can carry it to the coast and put it on vessels at very low cost. The Pennsylvania now holds a considerable interest in its three principal competitors in the soft coal trade, the Baltimore & Ohio, the Chesapeake & Ohio and the Norfolk & Western. In neither case, however, is the interest controlling, and the hopeful views expressed concerning the maintenance of rates and the placing of competition on a rational basis depend, therefore, wholly on the ability of the Pennsylvania to enforce its views by reason and persuasion. Mr. Green does not expect a cessation of competition; his company will simply endeavor to see that each road is managed conservatively. He speaks of the Norfolk & Western as being admirably managed, and says that there will be no change in the general officers. The tenor of Mr. Green's remarks indicates that the Pennsylvania will be in favor of having the home market supplied with coal by the Baltimore & Ohio and the Pennsylvania, leaving the prospective development of an export business to the Chesapeake & Ohio and the Norfolk & Western. Mr. Green says nothing about the competition on grain from the west, but his complimentary allusion to the present management of the Norfolk & Western confirms the general opinion that that road is not an unscrupulous rate-cutter. Besides good management, the Norfolk & Western has its full share of the "good luck" that now prevails, so that in this case as in that of the two other purchases, the Pennsylvania's investment is likely to be self-sustaining, regardless of any question of joint management.

Some useful experiments with colored glasses for fixed signals, by Professor Derr of the Massachusetts Institute of Technology, are reported in another column. The feature of this report which will be of most immediate interest to railroad officers is the confusion test with the yellow and the red glasses. Many superintendents and signal engineers who desire to use green for the all-clear night indication are looking for light concerning the third color which they will want for distant signals. It seems to us that, from this standpoint, Prof. Derr's report omits one important point; it is this; can a red light ever be mistaken for a yellow one, in practical signaling? This is the only question that need trouble a railroad officer. Whether yellow can be mistaken for red is another question. With both the red and the yellow "fairly bright," there is no difficulty in distinguishing them, says Prof. Derr. Probably everybody will agree to that. With both very faint or small, it is easy to mistake one for the other. That also will be admitted. Presumably this means either one; the yellow may appear red, or the red appear yellow. But neither of these cases exactly represents the actual problem. The first case, both lights "fairly bright," comes pretty near it; but how is it when they are not very bright, while yet they are not exceedingly faint? An engineman approaching a signal at night does not demand a perfect light at the extremest distance, but a distinctive light at a reasonable distance; which, for a distant signal, we may say, is from one-eighth mile to one-half mile. From inspections of the signals on the New York, New Haven & Hartford, we judge that, on this basis, the red and yellow are entirely satisfactory. The question comes ultimately to this: How far away are the colors sufficiently distinctive? Suppose, now, that a party of half a dozen persons with normal color sense proceed to measure off the distance until some one of the six feels a doubt about one or the other of the colors; it will be found that doubts will be raised about the yellow, long before any one questions the red. In other words, it is safe to say that at all reasonable distances, the stop signal, red, is unmistakable. A yellow might be called red, but a red would never be called yellow. If both colors are in view, the distinction becomes apparent in ample season. If only a single light is in view, and that red, there is no doubt. If only a yellow light is in view, there may be a doubt (if you are far enough away), but this doubt is on the side of safety. Red for distant and yellow for home might not be safe; as a runner might take the stop signal for one not requiring him to stop; but yellow for distant and red for stop is safe, as the doubt, if there be any, has to do with the signal which does not forbid the train to pass it.

It is proper to state that the red glasses in the semaphores on the New Haven road have a strong and uniform color. With so-called "red" glasses bought at different times and not made to any standard, it is imaginable, of course, that the results of tests like those above described might not be so favorable to the third color. On the other hand, we need not give this point extreme emphasis. While the writer was viewing a pair of semaphores one night recently (two homes and two distants on the same bridge), there came slowly along a passenger train with two tail lights, of which one was a good red and the other was a pale red. These were readily compared with the fixed signals; and it was noticeable that while the pale light was decidedly different from the semaphore red, it was yet equally distinct from the yellow. It was an unsatisfactory red, but still nothing like yellow. Clouds of smoke and steam from this train rose in front of the semaphore lights for a few seconds, but the partial obscuration made no appreciable difference in the distinctiveness of the colors; the red was no more like yellow, and the yellow no more like red.

Cape-to-Cairo Again.

There appeared in the February issue of the Engineering Magazine, in an article on the future of Africa, a few paragraphs about the so-called Cape-to-Cairo railroad. The writer undertook to show that a through line of railroad from Cape Town to Alexandria is not likely to be built soon, if ever, and that the reasonable way to enter Africa is by short spurs of railroad, in from ports on the Red Sea and the Indian Ocean. We shall not repeat here the line of reasoning which leads to this conclusion, a conclusion so obvious to anyone who knows about the conditions. The editor of the magazine could not, however, find it in his heart to let this great enterprise be turned down so lightly, and to his arguments we will devote a few words.

He says justly that such great undertakings have frequently triumphed over the doubters; that so it was with the Suez Canal and with the transcontinental lines of America; that facilities create traffic; that the visionary has often been more right than the statistician; that finally there is some great virtue, not to be measured by the return to the investors, in a great central bond "linking together the whole of the new wealth-producing and manufactures-consuming empire of Eastern Africa."

Something of this argument is based on a false analogy and something on failure to understand (or to accept) the vital facts of climate, soil and race. The only parallel between the early projects for an east and west railroad across the United States and the project for a north and south railroad through Africa is in that the distances are great and the population sparse. There the analogy ceases; and even up to that point it is more apparent than real.

From New York to San Francisco by rail is 3,266 miles; from Cape Town to Alexandria is about 5,600 miles. The difference is 2,300 miles or 70 per cent. This difference is colossal when we turn it into that much more railroad line to build, to operate and to keep up. That added 2,300 miles might easily mean $75,000,000 of investment, for railroad building through Africa can never be cheap. Possibly it might mean $150,000,000; no one can do better than make a wild guess.

But if any comparison can be made between countries and railroad lines so fundamentally unlike we should compare the space between Council Bluffs and Sacramento before the railroads were built, with the space between Assouan and Bulwayo, to be very liberal to Africa. That is, we should find in Africa 3,600 miles of railroad through undeveloped country, and in the United States 1,777 miles. The difference is 1,823 miles; or in Africa more than double the length must be built and maintained and worked, speculating on future development. Out of this the Wady Halfa-Khartoum road is built, but it can only be worked at considerable loss.

Comparison of the two countries as regards soil, climate and population is to compare that which is not comparable. The Nile valley from Assouan to Khartoum is desert excepting some very limited strips. It is not amenable to irrigation as is much of our western "deserts," and further, the water of the Nile is limited in quantity and can be used to better advantage in Lower Egypt. Above Khartoum we pass through some fertile country, then through great swamp countries, and, finally, through the equatorial zone. In this vast space many things could be grown, but not to compete with countries of better climate and with developed lines of transportation. But in this great space we find two most important serious obstacles to development; the climate is bad for white men, and in some regions deadly; the natives are primitive savages. They produce nothing that civilization wants and want nothing that civilization produces. When we say "nothing" we mean nothing approaching commercial magnitude. Those negroes can absorb a little cotton cloth, iron and copper and can pay for them in ivory or gums; but the sum total of the trade would be far from supporting a railroad.

Back of all this lies the fact that there are waterways existing that can be used to carry the commerce of the country if supplemented by some quite short railroads. The whole matter is pretty "academic," but if it is worth thinking about at all it is worth thinking about correctly.

Since this was written the April number of the Engineering Magazine has appeared with an article of 18 pages on the same subject. We fail to find in it anything to suggest a change in what we have said.

February Accidents.

Our record of train accidents in February, given in this number, includes 100 collisions, 121 derailments and 5 other accidents, a total of 226 accidents, in which 56 persons were killed and 171 injured. The detailed list, printed on another page, contains accounts only of the more important of these accidents. All which caused no deaths or injuries to persons are omitted, except where the circumstances of the accident as reported make it of special interest.

These accidents are classified as follows:

COLLISIONS.

	Rear.	But-ting.	Cross-ing and other.	Total.
Trains breaking in two	8	0	0	8
Misplaced switch	0	3	6	9
Failure to give or observe signal	2	0	4	6
Mistake in giving or understanding orders	0	3	0	3
Miscellaneous	5	1	12	18
Unexplained	22	13	21	56
Total	37	20	43	100

DERAILMENTS.

Broken rail	2	Bad switching	1
Loose or spread rail	2	Bad loading	1
Defective bridge	2	Too quick application of air brake	1
Defective switch	1	Runaway	4
Cave-in of coal mine	1	Unfastened switch	2
Broken wheel	5	Animals on track	1
Broken axle	8	Landslide	4
Broken truck	8	Washout	3
Fallen brakebeam	2	Ice on track	2
Brake hose burst	1	Malicious obstruction	1
Failure of drawbar	2	Unexplained	59
Broken car	1		121
Broken tire	1		
Misplaced switch	3		

OTHER ACCIDENTS.

Explosion of gas	1	
Broken siderod	—	
Cars burned while running	1	
Various breakages of rolling stock	2	
Other causes	1	
	—	5
Total number of accidents		226

A general classification shows:

	Collisions.	Derailments.	Other accid's.	Total.	P. c.
Defects of road	0	8	0	8	4
Defects of equipment	8	28	3	39	16
Negligence in operating	36	15	1	52	24
Unforeseen obstructions	0	11	1	12	5
Unexplained	56	59	0	115	51
Total	100	121	5	226	100

The casualties may be divided as follows:

Killed.	Collisions.	Derailments.	Other accid's.	Total.
Employes	22	16	0	38
Passengers	14	2	0	16
Others	1	1	0	2
Total	37	19	0	56
Injured.				
Employees	71	34	0	105
Passengers	31	34	0	65
Others	1	0	0	1
Total	103	68	0	171

The casualties to passengers and employes, when divided according to classes of causes, appear as follows:

	Pass. Killed.	Pass. Injured.	Emp. Killed.	Emp. Injured.
Defects of road	0	5	2	1
Defects of equipment	2	15	0	4
Negligence in operating	14	31	29	82
Unforeseen obstructions and maliciousness	0	4	5	9
Unexplained	0	10	2	9
Total	16	65	38	105

Thirty-three accidents caused the death of one or more persons each, and 43 caused injury but not death, leaving 150 (66 per cent. of the whole) which caused no personal injury deemed worthy of record.

The comparison with February of the previous five years shows:

	1900.	1899.	1898.	1897.	1896.	1895.
Collisions	100	80	76	44	34	43
Derailments	121	92	97	71	91	92
Other accidents	5	7	2	2	4	8
Total accidents	226	179	175	117	129	143
Employes killed	38	35	22	21	35	13
Others killed	18	6	5	3	2	5
Employes injured	105	118	58	40	54	75
Others injured	66	48	45	41	53	44
Average per day:						
Accidents	8.07	6.39	6.25	4.17	4.45	5.11
Killed	2.00	1.46	0.96	0.86	1.28	0.64
Injured	6.11	5.86	3.68	2.89	3.69	4.25
Average per accident:						
Killed	0.25	0.23	0.15	0.20	0.29	0.12
Injured	0.75	0.93	0.59	0.69	0.83	0.83

The worst accident in February was that at Ford River, Wis., on the 8th. There appears to be no explanation except that a heavy freight train, running at good speed in a blinding snowstorm, neglected to properly heed the station limits. Another serious passenger train collision appears to have been occasioned by a snowstorm, that at Elm Park, Mo., on the 27th.

There are three disastrous freight train wrecks in the present record: the derailment at Helena, Mont., on the 15th, the butting collision at Gorton, Pa., on the 8th, and the bridge disaster at Terre Haute on the 23d. The disaster at Helena occurred in the middle of the night on a part of the line where there are several tunnels and at a time when the temperature was 30 degrees below zero. The wind was blowing a gale and the smashup was scarcely less dramatic than the similar runaway on the same grade about three years ago. In the present instance several of the cars left the track inside of the Iron Ridge tunnel. The extent of the disaster at Terre Haute may be partly imagined from the fact that the work of building a temporary bridge required nearly seven days.

We find accounts of 19 electric car accidents in February, in which 39 persons were injured.

Annual Reports.

Pittsburgh, Cincinnati, Chicago & St. Louis.—The annual report of the Panhandle railroad for the year to Dec. 31 shows strongly the increased business which the prosperous condition of the country brought to the railroads in the manufacturing districts in particular. The company's traffic shows an expansion of nearly 3½ million tons, or over 19 per cent. in the number of tons moved, and of 24.4 per cent. in the ton-miles. In passenger business there was also a large expansion, 727,000 additional passengers being carried, the increase being 10 per cent., while the passenger miles increased 8.9 per cent. On the lines directly operated, covered by these figures, 1,403 miles, the freight earnings increased $1,617,200 and the passenger revenue $538,883. The total gross gained $2,254,166, but nearly $1,600,000 of this was absorbed by larger expenses, mostly maintenance charges, as will be seen by the comparisons of the income account for the last two years published below:

Earnings:	1899.	1898.	Increase.
Freight earnings	$14,411,093	$12,793,911	$1,617,182
Passenger earnings	4,965,230	4,426,347	538,883
Total gross	21,196,817	18,942,651	2,254,166
Expenses:			
Maintenance of way	$2,896,740	$2,651,031	$245,709
Maintenance of equip.	3,263,134	2,523,945	739,189
Conducting trans.	7,898,823	7,320,446	578,377
Total expenses	15,236,270	13,648,656	1,587,613
Net earnings	$5,960,547	$5,293,995	$666,552
Miscellaneous income	115,685	55,934	59,751
Total income	6,076,232	5,349,929	726,303
Fixed charges	3,623,466	3,573,398	50,067
Net income	$2,452,766	$1,776,531	$676,236

Out of last year's net income, which was equal to over five per cent. on the total stock capitalization, a dividend of 3½ per cent. on the preferred shares was paid, calling for $793,998. An appropriation of $406,963 was made for extraordinary improvement work. The various charges against the year's net income absorbed $741,700 of the year's surplus, nearly as much as the dividend payment, leaving a balance of $917,084 to be carried over to profit and loss. Against this account $342,655 was charged, representing premiums and discounts in connection with the refunding of high rate bonds for those bearing on interest rates.

The traffic statistics show a further advance in the economy of movement, and the cars and tons per train reached the largest figures so far reported. This nearly made up for the loss in the ton-mile rate, which declined from 6.2 mills in 1898 to 5.6 mills. The profit per ton-mile was 1.3 mills last year, against 1.5 mills in 1898.

Passenger Rates in Europe.

In the debate in the Prussian Diet over the State Railroad estimates, one of the deputies urged a general reduction in passenger fares. In his answer Minister Thielen said that in spite of various very cheap commutation tickets of different kinds introduced of late years in various South German states, the average rate per passenger-mile actually received in Prussia remains the lowest, being 1.024 cents, against 1.215 in Bavaria, 1.119 in Saxony, 1.089 in Wurtemburg, 1.204 in Baden and 1.267 in Alsace-Lorraine. This is due—though the Minister did not enlarge on that fact—to the existence of the fourth class in Prussia.

The claim that reductions of fares of late years in Austria, Hungary, Denmark, Russia and Belgium have had satisfactory financial results, the Minister contradicted squarely. Austria, since the introduction of its first zone tariff, has raised fares twice. Hungary has had to issue a loan of $60,000,000 "to cover working expenses and the increased requirements for rolling stock." [But, we interpolate, the Hungarian authorities do not admit any decrease of net earnings due to the zone tariff.] In Denmark the net earnings fell off 40 per cent. in the first year after the reduction of fares. In Belgium the workmen's rates, which the Deputy had emphasized particularly, are since the reduction higher than the Prussian workmen's fares. In Prussia the reductions apply only to great distances, and were doubtless suited to the peculiar circumstances of Russia, but would not suit Prussia.

The Prussian Government proposes a modification of its passenger tariff which, while increasing the price of return tickets on express trains, will reduce the price of single tickets, the intention being to leave the average rate unchanged. Also, various tourist tickets at reduced rates are to be abolished. The Minister supported this change partly because of the great complication caused by special rates, and as an illustration he said that in a single Berlin station 47,000 different sorts of tickets are sold.

A patriotic Russian complains that since the building of the most easterly section of the Siberian Railroad as originally designed, from Vladivostok northeast to the Amoor River, the trade of the Amoor Valley has been captured by the Americans. Flour, iron, hardware, household utensils, etc., are brought from America and thence distributed to the settlements on the Amoor. Why this particular part of Asia should be in this situation it is not easy to understand unless the numerous vessels carrying rails, machinery and other material from the Atlantic coast and lumber from the Pacific coast to Vladivostok for the railroad have afforded opportunity to send other goods in readily. The population of the valley is extremely small, though there are some gold mines there, and were it not for the materials for the railroad, it would probably not be possible to get a full cargo for Vladivostok except at very long intervals. But some of the Russians intimate that Americans are likely to secure the gold and other mines, and capture the best opportunities for profitable industries in the East, as Belgians and the West Europeans have secured the most promising coal fields in West Siberia.

The Prussian Minister of Public Works, in his speech concerning the State Railroad system, estimates that the earnings for the current year (ending with March, 1901) will be 2 per cent, greater than the revious year. His estimates for 1899 were for an increase of 1 1/3 per cent., or $4,000,000; but the actual increase has been about $17,000,000, or 5½ per cent. These estimates are important as giving a judgment from what is probably the best informed source of information concerning the actual condition and course of business in Prussia. The Minister evidently believes that business has now reached high-water mark, but that there is no present probability of any subsidence. Indeed, in the course of his speech he expresses his belief that the growth of business, which has lasted longer there than here, has been healthful and not likely to result in a reaction.

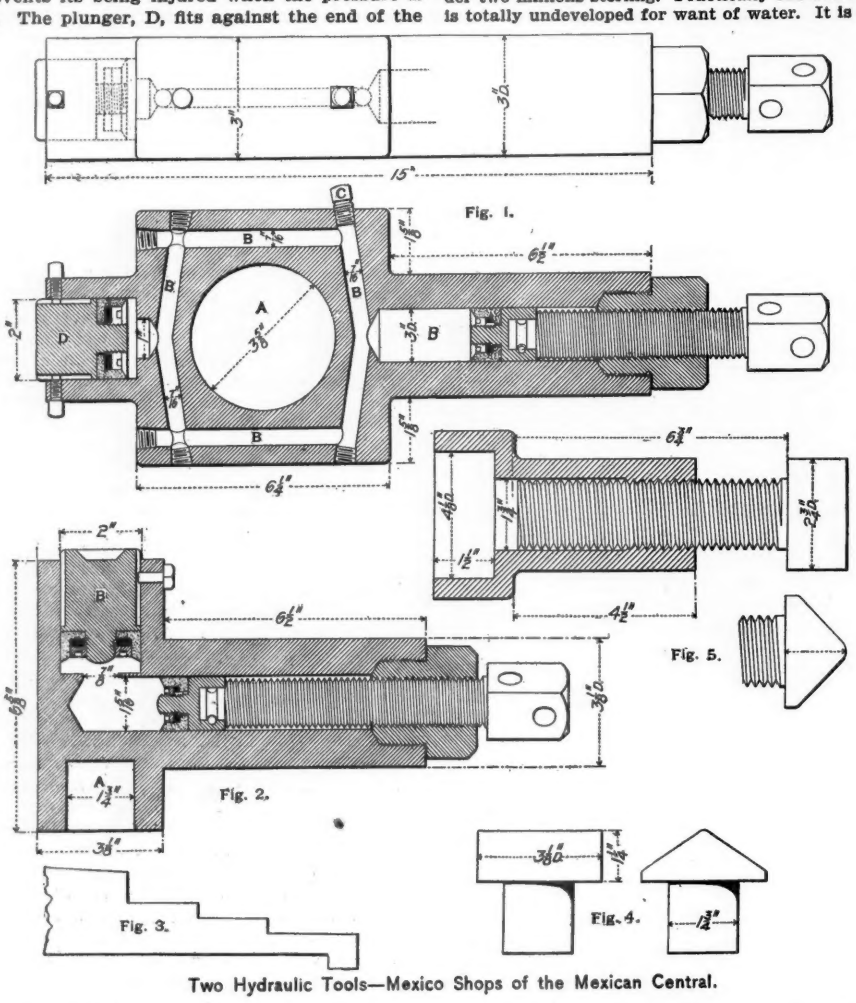
Railroad freight traffic during the past few months seems to have been extraordinarily heavy over nearly all Europe; but nowhere does it seem to have exceeded the capacity of the railroads so much as in Belgium, where the blockade has been terrible, and the management seems to have given up trying to handle all the business. Agents have been sent to most of the European locomotive works to try to

secure the early delivery of a large number of locomotives, and many new freight cars have been ordered. Belgium being a great producer of coal and iron, and these being the products for which the demand has increased most during the past year, it is natural that its traffic should have increased more than that of most other countries.

Two Handy Shop Tools.

Two very handy tools for repairs on locomotives are shown in the accompanying drawing. They were designed by Mr. Chas. E. Foltz, Foreman of the tool room of the Mexico shops of the Mexican Central Railway.

Fig. 1 is an hydraulic ram for removing piston rods from crossheads. It is made of steel with the ordinary cup-shaped leather packing, and as the majority of the locomotives owned by this company have crossheads of the type that fits between two guides, a top and bottom one, this ram is made of such a width as to permit its being inserted between the two sides of the crosshead after the main rod has been taken down. The passages, B, are filled with oil by means of the filling plug, C, and the pressure of the screw is transmitted by the oil to the plunger, D. After putting the ram in position, the crosshead pin is replaced, passing through the hole, A, while the width, which is 3 in., insures a good bearing across almost the entire length of the pin, and prevents its being injured when the pressure is applied. The plunger, D, fits against the end of the piston rod and a few turns of the screw is sufficient to start the rod.



Two Hydraulic Tools—Mexico Shops of the Mexican Central.

Fig. 2 is another hydraulic tool for removing cylinder saddle bolts. It also is made of steel and is of the same general construction as the preceding Fig. 1. The step, Fig. 3, is placed on the valve seat, the lip on the under side of it hooking over the edge of the seat, and the steps serving as bearings for the ram. The necessary adjustment is secured by means of the pieces, Figs. 4 and 5; Fig. 5 being inserted into the socket, A, of the ram when the cylinder saddle is low, and Fig. 4 being used when the cylinder has a high saddle. The plunger, B, is placed against the end of the bolt, and the pressure applied by means of the screw.

Worn Wheel Flanges.

We find in the March issue of the Proceedings of the St. Louis Railway Club the following note from Mr. P. H. Griffin on the cause and prevention of worn wheel flanges.

We have read with interest the discussions in your January and February pamphlets on the causes of flange wear on car wheels and beg to suggest a cause for such wear and its increase, which does not appear to have been referred to in your discussions.

The variation in diameter of wheels on opposite ends of an axle will cause the largest diameter of wheel to travel forward as far as the flange will permit, and both wheels must revolve in that position with flanges crowding against the rail. The increase in speed and load of freight cars intensifies the wear produced by this condition and leads to excessive flange wear whenever it prevails. That wheels of different diameters are placed on the same axles in many cases is beyond question, especially under new cars.

Wheels have been taped and gaged with more care of late years by many railroads, but there is still room for much improvement in that direction. We have advocated for a number of years the improvement of mechanical conditions under which wheels are put in service. The present practice in fitting wheels for freight service is far from what it should be. We believe that the average cast wheel in use is ⅛-in. out of round. Although many specifications call for a test to determine this condition, it is practically impossible to apply the one stipulated.

There can be no doubt that there is great need and much room for improvement in mechanical conditions prevailing in the present use of chilled wheels, and that improvement in this respect would increase the life of wheels very much.

The saving in power required to haul trains, and wear and tear on track and equipment, would, in themselves, constitute good reasons for taking up this question vigorously, and as the increase in speed and load progresses the importance of the subject will become greater.

The Assouan Dam on the Nile.

The area of Egypt is 6,250,000 acres. Of this, 4,130,000 acres produce a rental of twenty millions sterling; while the remaining 2,120,000 acres produce a rental under two millions sterling. Practically one-third of Egypt is totally undeveloped for want of water. It is to rescue some of this land, and also to render more certain the perennial irrigation of other portions, that the great dam on the Nile at Assouan is now being built. The original plan contemplated flooding the Temple of Philae for several months each year, and met with such violent opposition from archaeologists and others, that the Government was obliged to give way and reduce the water surface from a height of 114 metres above datum to 106 metres. Whether this will ultimately save the temple remains to be seen, but it greatly reduces the storage capacity, which now stands at 1,065,000,000 cubic metres, the length of the reservoir being 111 miles. The dam is to be a single straight masonry wall, pierced with 140 under sluices of 14 square metres (107.6 sq. ft.) area each, and by 40 upper sluices of 7 square metres each. The total area of opening will be 1,960 square metres (21,097 sq. ft.) for the under sluices, and 2,240 square metres (24,111 sq. ft.) in all. The dam will have a total length of 1,950 metres (1.21 miles) on a perfectly straight line, and will be founded everywhere on granite rock. The maximum head of water will be 20 metres (65 ft. 7 in.) and the maximum height of water 28 metres (91 ft. 10 in.). The width of the dam at the top will be 7 metres (23 ft.), and at the bottom 24.5 metres (80 ft. 4 in.). During the whole of the Nile flood all the sluices will be fully open, and the water will be discharged through them. The maximum discharge of an extraordinary flood is 14,000 cubic metres (494,000 cu. ft.) per second, and this will traverse the sluices of the dam with a velocity of 6.25 metres (20 ft. 6 in.) per second, and a head of 3 metres (11 ft.).

The highest known flood level reached the level of 99.78 metres, which means that there were only two points of land visible from bank to bank. At low Nile there is water in five channels only, the East and the Termooseyah channels being dry. This fact is revealed in the large amount of foundation work already completed in this portion. The masonry goes very deep in places, the granite rock being badly decomposed and needing very extensive excavation before really solid rock is reached.

The difficult problem which faced the contractors was putting in the foundations in the five low-water channels. It must be remembered that these are just below the cataracts and that the water rushes through them with enormous velocity, and that it was quite impossible to predict what their bottoms would be like. The same general method has been adopted in each case, and at the time of writing four channels out of five have been closed, the West being the only one open. At the lower, or north, side of the site of the dam a bank, locally known as a "sudd," of rock was constructed across the channel. This was a work of great expense and difficulty, as the current was capable of taking a 4-ton block of stone and carrying it along as if it had been a football. Nevertheless, progress was gradually made, and the sudd grew out from the river bank into the channel. Occasionally a part of it would be swept away with the railway and steam crane upon it, and the work had to be done over again. In the case of the sudds in Bab-el-Kebir and Bab-el-Haroun, rails and bar iron were used to tie the embankment together. Of course such a loose rubble dam was not watertight, but it secured a reach of quiet water above it, in place of the wild rapid that had previously been there. The next step was to make a tight bank above the site of the dam. This was done by means of bags of sand, the quantities used being enormous. The lower bank was then made tight by sandbags and sand, and then the question remained to be settled whether the bottom was tight. The general appearance of the rocks was by no means reassuring on this point. It was perfectly possible that there might be fissures in direct communication with the river above, which would supply water faster than any possible pumping plant would deal with it. If that had been so it would have become necessary to put in the foundations under compressed air, a work of great difficulty and immense expense. Fortunately nature was kinder to the engineers that she often is, and the powerful pumps which had been provided proved to be unnecessary. Four channels were pumped out in succession, and are now practically dry, and only one is left in doubt.

The contractors have now several months before them in which to get in the foundations in these channels, before they are driven away by the floods, and may be expected to make the best use of their time. When the flood comes they will, necessarily, have to suspend many of their operations, as a great part of the work will be submerged. Probably several of the sluices will be got in ready to pass the low Nile of next winter.

From a report by Mr. W. N. Bakewell we learn that the navigation channel is practically down to the reduced level of 90 metres for 525 metres south of the axis of the dam. Work is being rapidly pushed forward in the lock channel. In the first lock the excavation is being carried down deeper than expected, as the bottom is soft. The second lock is down to the full depth in several places, and offers a good foundation.

Naturally it will be a considerable time before such an important work can be completed and come into operation. When storage commences, the effects on Egypt will be immediate and great, although the country could well do with a much greater quantity of water than the reservoir will provide. The final designs and specifications were drawn up in accordance with the decision of Sir William Garstin, K. C. M. G., the Under-Secretary of State for Public Works, Mr. W. J. Wilson being the chief engineer, and in consultation with Sir Benjamin Baker, K. C. M. G., F. R. S., who was appointed consulting engineer to the works by the Egyptian Government. Messrs. John Aird & Co., of London, are the contractors, with Mr. John Blue, as chief agent, and Mr. Maurice FitzMaurice as resident engineer.—Engineering (London).

Steel Crossties in Sumatra.

The discovery of rich coal deposits in the mountainous interior of the island of Sumatra, in the Dutch East Indies, in 1887, started the railroad from the port of Emma, in the neighborhood of the city of Padang, to the Barisan Mountains. At present 210 kilometers of the railroad is in operation, 36 kilometers of the rack (Riggenbach), and 174 kilometers of the ordinary adhesion system. The gage of this railroad (which is the property of, and exploited by, the Netherlands Government) is 1.067 meters, the same gage as the Netherlands State railroad on the island of Java. The greatest grade on the ordinary lines is 1 in 43.5, and on the rack line 1 in 12.5, while the sharpest curve is 150 meters radius. The railroad rises 1,154 meters above the level of the sea.

The rails weigh 25.7 kilograms per meter and are laid on steel sleepers, weighing 39 kilograms (system Post). On the common track lines, eight sleepers, and on the rack lines, 9 sleepers are provided for each rail length of seven meters. The total superstructure, including fastenings, weighs 105 kilograms on the adhesion and 187 kilograms per meter on the rack lines. In a tunnel 825 meters long, rails of 40 kilograms per meter have been employed on account of loss by corrosion. The heaviest locomotives weigh 35 tons, 9.3 tons resting on each of the three coupled axles, and 7.1 tons on the driving axle. The greatest speed is 30 kilometers per hour.

The best timber available in the Colony for crossties is the djatti wood, a kind of teak, similar in its qualities to oak. Under the influence of the climate, wooden ties would not last more than 8 or 10 years. The steel sleepers employed, however, as shown by close examination made in the spring

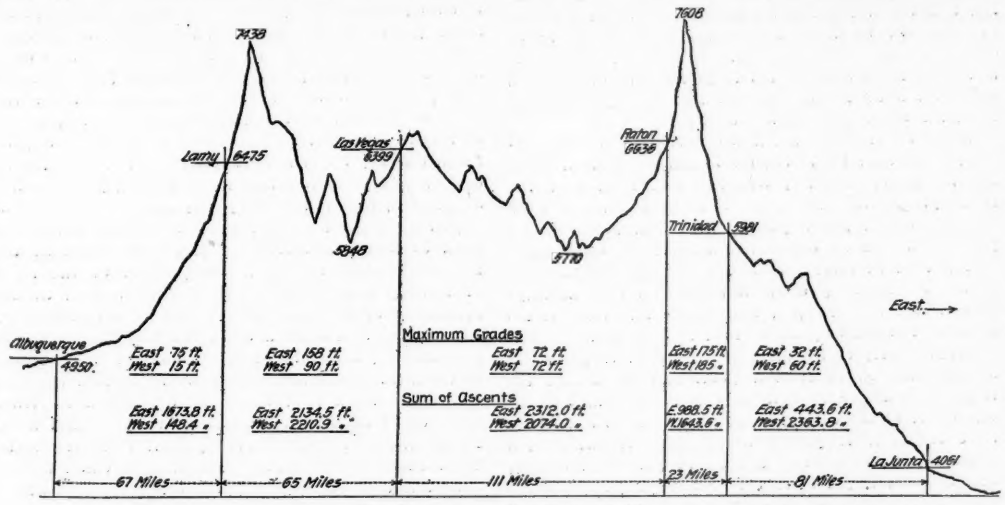
of 1899 on the 60 kilometers long line Emma Port-Kaiutanam—after having been used for 9½ years and run over on the different lines by from 31,200 to 104,000 trains—were found to be in a very good condition. A close examination made of 11 ties taken from the track at different points showed an average decrease in weight of 100 grams caused by wear and rust, or about ¼ per cent. of the original weight per year. On a few sleepers exposed to humidity the decrease in weight was found to be a trifle greater. The wear on the top of the rails at points where the rails were fastened was, in most cases, insignificant; on a few other crossties taken from places where especially unfavorable influences prevailed the wear amounted to three millimeters below the exterior part of the rail-foot. The engineer-in-chief of the line thinks that by the adoption of plates this unfavorable influence of the exterior edges of the rail could be avoided, or at least decreased to a large extent. The wear of the bolt holes was unimportant.

The gage was, on the whole, well preserved. Only in the curves of 150 and 200 meters radius some defects of gage of from 9 to 12 millimeters were found resulting from the wear of bolts and bolt holes. In order to avoid this it is proposed to increase the number of sleepers by one or two per rail length.

A calculation of the cost of the wooden and steel sleepers showed that the latter are cheaper, if they remain in good condition for 19 years. From the condition of the steel sleepers after 9½ years it may be asserted that the average lifetime of steel sleepers considerably exceeds 19 years.

Fast Run on the Atchison.

On Tuesday, Wednesday and Thursday of last week the Atchison, Topeka & Santa Fe ran a special train from Los Angeles to Chicago, 2,266 miles, in a trifle less than 58 hours, or at the rate of 39 miles an hour. This train, which consisted of one private car, one combination and one baggage car, was run for Mr. C. R. Peacock, who desired to reach Pittsburgh, Pa., by Saturday to attend a meeting of the Carnegie Company; and it is said that he paid for the trip $3,000. His family was with him and the party consisted of nine persons. Mr. Peacock took the 11.30 train Thursday night from Chicago to Pittsburgh over the Pennsylvania Lines and reached his destination at 6.30 p. m. on Friday. The Atchison made about 12 hours better time than was required by the contract, and the time of the train through was about eight hours less than that of the California Limited. It will be noticed that east of Emporia the time was not particularly fast, so much time having been gained over the prescribed schedule up to that point that it was decided to run the remainder of the distance at a more moderate pace. Engines were changed 15 times.



Profile of the Atchison, Topeka & Santa Fe, Between Albuquerque and La Junta.

The time of the special train at the principal points is given in the table herewith. This is not the official record, but the figures were furnished by officers of the company. It will be noted that on the level divisions in Kansas the net speed for a long distance was about a mile a minute. This is just about the same rate that was made by the Burlington road between Chicago and Denver in February, 1897. The run most nearly comparable with the present run, for its whole length, is that which was made over the Canadian Pacific in August, 1891, from Vancouver to Brockville, 2,792 miles, at 36½ miles an hour.

Perhaps the most notable part of the Atchison run was that from Albuquerque to La Junta, 347 miles, in which distance the train had to rise 7,492 ft. A profile of this part of the road is shown in the accompanying engraving.

	Miles.	March.		Time.		M. P. H.	Net Time.	M. P. H.
					h. m.		h. m.	
Los Angeles	0	27	Pacific time.	10:00 a. m.	....	....	....	.....
Albuquerque	889	28	Mountain time.	12:23 p. m.	25:23	35.	....	.....
" Leave	0	28	" "	12:40 p. m.	....	....	....	.....
La Junta	347	28	" "	11:38 p. m.	10:58	31.6	....	.....
" Leave	0	28	" "	11:45 p. m.	....	....	....	.....
Dodge City	202	29	" "	3:32 a. m.	3:37	55.8	3:22	60
" " Leave	0	29	Central time.	4:30 a. m.	....	....	....	.....
Emporia	241	29	" "	8:49 a. m.	4:19	55.8	4:02	60
" Leave	0	39	" "	8:55 a. m.	....	....	....	.....
Argentine	127	29	" "	11:50 a. m.	2:55	43.5	....	.....
" Leave	0	29	" "	12:08 p. m.	....	....	....	.....
Chicago	460	29	" "	9:56 p. m.	9:48	46.9	....	.....

Los Angeles to Chicago, 2,266 miles, 57 h. 56 min. = 39 m. p. h.; La Junta to Argentine, 570 miles, 10 h. 51 min. = 52.5 m. p. h.

Clubs for Railroad Employes

The social side of the railroad employe's life—the side that is cultivated when he is off duty—has now been the subject of organized attention (chiefly by the Young Men's Christian Association) for so long a time that the instrumentalities used in the work have come to be looked upon by everybody as fixtures in the railroad world. And as this social institution, under the discreet management of the energetic secretaries, local and national, keeps pace in growth with the growth of the railroad world, it will not be out of place at this time to make record of the progress that has been made. Such a sketch has been attempted in the following paragraphs.

Different railroads have encouraged, many of them by direct initiative and contributions in money, the establishment of clubs where the men can find bathrooms, reading and smoking rooms and bedrooms, their affairs being wholly or partly administered by officers elected by the employes from their number. These clubs, however, have usually languished, other associations often proving too strong to allow the interest now and then awakened in them to endure.

Some force, persistent and well directed, is needed to enlist and sustain the interest of the men, to keep the clubs attractive, to spread the habit of reading, to encourage the use of bathrooms, to promote plans for acceptable entertainment. A railroad company desiring to apply such a force, without extraneous assistance, cannot do other than place the organization and conduct of the clubs in the hands of a bureau devoted solely to the work and officered by carefully selected men. A bureau for this purpose was recently established by the Atchison, Topeka & Santa Fe and the great measure of success it has already attained is shown in a letter from its superintendent, extracts from which are printed herewith. Other railroad companies whose lines traverse the Western mountains and deserts have under consideration the establishment of similar bureaus.

Those companies, however, who do not think it advisable to establish a bureau solely for the direction of employes' clubs have ready at hand an institution which will do this work for them. The Young Men's Christian Association, in proof of its claim that it provides an adequate agency for the conduct of employes' clubs through its Railroad Department, points to the fact that sixty-five clubs conducted under its auspices in 1890 increased to eighty-nine in 1895; to one hundred and three in 1896, one hundred and twenty-one in 1898, and to one hundred and fifty-one at the present time. It points to the fact that many railroads which had established clubs to be managed under their own auspices or that of their employes, notably the Pennsylvania, the Union Pacific, the Chesapeake & Ohio, and the Long Island, subsequently turned these clubs over to the guidance of the Association.

The work of the Association among railroad men began in the early seventies and was principally of an evangelistic character during that decade. In the next ten years a railroad manager here and there began to see that the associations could become an effective agent in improving the personal habits of his employes, and a certain co-ordination between the railroads and the Association led to the latter seeking to enlist the sympathy of the men through other than evangelistic methods. The success was so pronounced that before the decade had closed railroad companies in many cases had contributed funds for the erection of buildings to be used exclusively as railroad men's clubhouses under the auspices of the Association, and this practice has steadily extended.

The officers of the Association state that their first aim is to make a club socially attractive to every railroad employe, whether he be Protestant, Catholic, Jew, or without church affiliation. Through an educational bureau are provided lecturers upon subjects of practical interest to railroad men, and where conditions will permit, classes are arranged for themselves and their sons for study in mathematics, mechanics and other branches of use in their vocation. They state that, while the inculcation of religious precepts in no sense is regarded as subordinate to these other aims, and careful attention is devoted to the programme of religious exercises, they thrust religion at no man, compelling no member to attend religious services. It would seem that thereby may be attained the happy medium, winning commendation of the railroad manager who asks of the clubs only that they help to keep his men clean, healthy, and contented, as well as of the manager of religious temperament. It cannot be denied that through an organization, the officers and secretaries of which constantly study, periodically discuss and persistently apply the methods leading toward certain ends, those ends are more likely to be attained than through unorganized, separate and desultory effort, and therefore the conclusion is irresistible that under present conditions the railroad department of the Young Men's Christian Association, with its careful supervision, through the International Committee is well equipped for that oversight of the welfare of railroad men which does not come within the bounds of railroad discipline, but which is essential toward obtaining the best results from that discipline.

The Association does not ask a railroad company to erect a building entirely at the company's expense, but it undertakes to obtain contributions from the men themselves and from the people of the town to defray a considerable portion of the cost. A secretary of an Association, in the face of doubt that he could raise $1,500, expressed by the railroad company in interest, obtained over $5,000 for this purpose within four weeks in the town of Moberly, Mo. The privileges of a club are not extended gratis, no self-respecting American citizen desiring to have even the semblance of being an object of charity. A nominal membership fee, usually $3 a year, gives the freedom of the clubhouses and the bathrooms. A small charge of usually ten cents a night is made for the use of bedrooms, and where luncheons or meals are provided it is the aim that this service be self-sustaining.

One of the first and most successful Association clubhouses was that erected entirely at the expense of Cornelius Vanderbilt near the Grand Central Station, New York, and opened in 1887. There are now in that city five different clubs which are freely used by the employes of the New York Central and allied railroads. There are 13 other clubs, many of them in their own houses, at points along the New York Central Railroad from Albany to Buffalo, having a membership of 6,517, conducted at an annual expense of about $45,000, of which about one-third is contributed by the railroad company, one-third by the employees and the remainder from other sources. The general officers and superintendents of the road frequently address meetings held in these clubs, thereby in a measure coming into social relation with their men. Along the Chicago & Northwestern are five associations, three in especially equipped buildings. Along the Chesapeake & Ohio, within nine years, associations have been established at eight points, four of them occupying buildings especially erected for their use. Their total membership is 1,391 and the average daily attendance over 900. On the Norfolk & Western, within eight years have been organized five associations having a total membership of 1,295.

The records of the associations at particular centers, taken at random from the official reports, show that at Albany there is a membership of 540, with a daily attendance of 398; at Philadelphia a membership of 1,749, with a daily attendance of 400; at Clifton Forge, Va., a membership of 400, with daily attendance of 182; at Kaukauna, Wis., a membership

of 128, and daily attendance of 126; at North Platte, Neb., a membership of 270, with daily attendance of 107.

The association work attracted the attention of Prince Hilkoff, the Imperial Minister of the Russian Railways, and preliminary steps are now being taken to establish associations along the Russian state railroads, Mr. C. J. Hicks, a Secretary of the International Committee, at his request having made a personal investigation of the conditions surrounding the railroad men in Russia and reported as to how this work could best be introduced.

Mr. S. E. Busser, Superintendent of Reading Rooms on the Santa Fe System, gives us the following account of the work on that road:

There are two methods of conducting these enterprises, in operation at the present time on the Santa Fe System. The one is known as the Y. M. C. A., the other as the Santa Fe method. We have Y. M. C. A. buildings at Argentine, Kan., Topeka, Kan., Temple, Tex., and Cleburne, Tex. We are also joint contributors with other lines in the support of such associations at Chicago and Kansas City.

These buildings, methods, machinery, teachings, and operation are all under the control of the International Committee of the Young Men's Christian Association of New York, whose able and enthusiastic Secretary is Mr. C. J. Hicks. The fact that we have another method, distinctly our own, must not be construed as in the remotest sense interfering with or handicapping the work of the Y. M. C. A. The Superintendent of Reading Rooms of the Santa Fe cordially co-operates with them. At the present time he is placing $500 worth of books in the Y. M. C. A. buildings at Temple and Cleburne, which will freely circulate among the entire membership. These Y. M. C. A. buildings and organizations on the Santa Fe have several peculiarities, which it may be proper to mention.

(1) The membership is not limited to railroad employes, but comprises all young men in the city where located. At Temple, Tex., only 30 per cent. of the total membership is composed of railroad people and less than half of these are regular attendants.

(2) These organizations are members of the State Association of the Y. M. C. A. and contribute regularly to the support of the work in other localities. On the Santa Fe they are not intended to be distinctively railroad associations and the credit of their existence is not given to the railroad company, but to the evangelistic influences of the age, as the outgrowth of aggressive Christianity.

(3) In these associations on the Santa Fe, the wife, the family and the home are not directly considered. This will doubtless be provided for later, but at present ladies and children seldom frequent the buildings.

The plan employed at the other places, what is known as "The Santa Fe Method," of organizing and operating reading rooms, is the outgrowth of Mr. Ripley's broad and progressive policy in the treatment of his employes. This policy is expressed in his own words, which constitute the foundation stone on which the work is built:

"Whether or not there is a world beyond the one we live in is a disputed matter; but we may be perfectly sure that the man who walks with truthfulness, sobriety and morality; who is what the world calls 'straight,' and who can look everybody in the eye, will command the respect of his neighbors and of himself, and will be infinitely happier in this world than the man who does not; and if there be another world, he need not fear it, whatever may be his religious beliefs or non-beliefs. The officers of this company expect, and propose, to deal justly and fairly with its employes, and they believe the latter want also to be just and fair.

"We want them to see what is right as between themselves and the company, to the end that we may all pull together, and the more they read and study, the better it will be for us and for them. We make no pretense to unselfishness—we aim only to practise enlightened selfishness; we want better men, and we are willing to spend money to make them better, because they will do their work more intelligently and more conscientiously, besides being much happier themselves. We concern ourselves with no man's religion or politics—we only ask in him the qualities that make him valuable to the company, which are also the qualities that will make him a good husband, good father and good citizen."

For many years the Santa Fe sustained reading rooms at various division points for the use and development of the employes, but it not being the special work of anyone, and no one being placed directly in charge, they languished and the books were unused. Fifteen months ago a special department was organized called the "Department of Reading Rooms and Libraries," and the writer was placed at the head of it. It has been his duty to reorganize the work, to establish new rooms where needed, to instruct librarians as to how to make the rooms attractive, to recommend improvements, to meet familiarly with the men and their families, to encourage them to read good literature, and help them, so far as possible, to get more out of life. He has arranged and conducted many public gatherings of the men, frequently taking with him some eminent lecturer, and closing with a social dance and reception. If the building was too small he would rent an opera house. He formed orchestras from among the men and women. He found employes who could sing acceptably, who were experts at comic recitation and clog dances and specialties of all kinds. The expenses of these entertainments averaging about $21, were cheerfully assumed by the management of the road. The self-development, incident to such meetings, calling out diffident employes to partipate in the programme, and arrange the exercises, has been very marked and pleasing all round.

Superintendents, Train Masters, Master Mechanics and other officials frequently attend these gatherings and mingle among the men. At one entertainment a master mechanic sang a solo and was encored to the echo. In all these gatherings there is no use of the religious spirit except in that broad sense of making this world better by developing a rich manhood. The spirit of the gatherings is crystallized in three short phrases: "One world at a time;" "Do right because it is right, and not for a reward;" "Work to finish your job, and contribute something to the race, not simply to get wages."

The writer of this paper could fill a book with experiences of the past year, indicating that this work, absolutely non-religious, absolutely conducted as a business proposition, without regard as to whether there is a God or no God, without Bible and tracts and prayer services, is wonderfully rich in the best results. Let me definitely analyze our organization and method.

We have these reading rooms at Dodge City, Kan., La Junta, Col., Raton, N. M., San Marcial, N. M., Purcell, I. T., Woodward, Okla., Newton, Kan., Albuquerque, N. M., Winslow, Ariz., Seligman, Ariz., and Needles, Cal. We have in prospect many other points. Let us take our latest room, at Seligman, Ariz., as a sample. The others are nearly the same, and all under "The Santa Fe Method." The room at Seligman was formally opened Nov. 30, 1899. The building cost $5,000. It contains two large rooms 50 by 50 ft., one central room 30 by 30 ft., four bath rooms with the best porcelain tubs, and two toilet rooms with all modern conveniences, a large wash room with marble bowls, and a large boiler furnishing hot water for the bath and toilet. In the one large room, we have the best billiard table to be bought and other facilities of amusement. The table is in use from 9 a. m. till 10 p. m. We charge ten cents an hour for the use of it. This goes into a fund for the repair of the table.

In the other large room we have two reading tables, each 4 ft. by 10 ft., on which are placed daily the leading monthlies, weeklies and dailies of the country. In this room there is also a large book case in which are kept the best and latest books published. These books are numbered, catalogued and placed in circulation. An employe or member of his family may draw a book and take it anywhere. He may keep it two weeks and have it renewed. All we require of him is that if he lose it he replace it; if he damage it, make it good. If anyone desires to read a particular book and the request is made known to the Librarian, and he reports it to the Superintendent, the book is at once sent there, if it passes inspection. About 40 per cent. of the books are novels, 20 per cent. history and travels, 15 per cent. scientific and the rest technical and general. All monthlies three months old, all weeklies four weeks old, and all dailies one week old are sent each week to the section foremen along the line for distribution among the trackmen and thus they go into families at remote places, where the children seldom see a picture or printed page.

We pay our librarians, as a rule, $50 a month and perquisites, and they are regularly on the pay roll of the company. The baths are free to all employes; though, if the Librarian furnishes the towels and soap, the men cheerfully pay him ten cents for each bath. Every Friday night at Seligman they have a club meeting of the employes and their families. There is a piano in the room. They have recitations, music, cards and a dance till 12 o'clock. In the center room referred to above we have four large card tables and some easy chairs, and the Librarian has a case in which he keeps cigars and tobacco on sale to the men, which adds some to his income. On the walls we have pictures to make it a pleasant resort for men and women. The mother brings her children, and often they have a social reunion. It is truly an oasis on the desert and the men call it their heaven, or haven.

Alongside the reading room is a croquet ground, and frequently men and their wives have a tilt with the mallet. The Superintendent of Reading Rooms and his wife have gone there and mingled among the members, had a game of croquet and of whist with them; and we were convinced that the reading room at Seligman was truly a God-send. Before this reading room was built, an employe coming in off his run, had to lie around the round house or on the platform, or was tempted to frequent a gambling hole. Whether he won or lost, he was nervously exhausted. He got no rest and became indifferent as to his work. He felt mean and was tempted to act mean. Now he can take a bath and have a sleep, and get up to meet pleasant company, have a game of billiards or cards, associate with his fellow men as a man, and consequently he is clear in understanding his orders, and goes out determined to make the best run ever made. This is the business side of our reading rooms, enabling us to keep the best men in localities undesirable for residence. This has a direct tendency to reduce wrecks to a minimum. On top of the reading room, we place a sign which reads: "Santa Fe Pacific Reading Room for the Use of Employees."

We are proud to let the public know that our employees are a reading, thinking and knowing class of people. An eminent educator of the country said to the writer some time ago, "I feel safer in riding with such men."

We have a system of reports, monthly and quarterly, by which we know how many attend these rooms daily and how many books are read daily. The report for August shows, for the reading room at Dodge City, an average daily attendance of 44; books read or consulted, average per day, 32; visited the room during the month, 1,364; books used during the month, 992.

In the three months, August, September and October, 3,782 visited the room and 2,697 books were used. This is the weakest room we have. It is inaccessible and will soon be moved and improved, yet it is doing excellent work. At La Junta the average daily attendance was 160 in August. At Raton it was 70 the same month. West of Albuquerque these figures as to attendance and reading of books are doubled. At Needles the books are wearing out by use.

American Practice in Block Signaling.*

By B. B. Adams.

VI.

SINGLE TRACK BLOCKING—CONTINUED.

The block-signaling rules of the Chicago, Milwaukee & St. Paul are so full and so clearly worded that the reader will readily understand the practice from a single perusal. The rules prescribing the procedure for sending forward a train under ordinary circumstances are Nos. 32 and 38. The cross-over rule, No. 20, prescribes a practice which is not found on many other roads. This rule, forbidding the irregular use of a main track, even at a station, and even when suitable flag protection has been provided, unless permission has first been received from the train dispatcher of the Division, makes it possible to run fast special trains at any hour of the day or night on very short notice. At large stations and at certain junctions this rule is, of course, permanently suspended, and a notice specifying such stations is kept standing on the time table. This is necessary, both to facilitate switching and train work at the station, and to relieve the dispatcher of the labor of issuing a large number of orders. But at the multitude of smaller stations the rule is found by the officers of the road to be a desirable safeguard, and the dispatcher has as good control of his tracks as though no crossovers existed. When he has a fast eastbound train that would be delayed if its track were to be used at a station by a westbound train, he withholds the cross-over permit from the latter until the eastbound has passed; and when he has occasion to issue a cross-over order he first blocks all trains one station back.

Among the prominent roads using the block system on single track are the Erie, the Wabash and the Atchison, Topeka & Santa Fe.

On the Erie lines west of Salamanca the block system has been in use since 1891. According to the rules then prescribed and which have been continued in use to the present time and are now in force from Salamanca to Chicago, 574 miles, the block signaling is under the immediate active control of the train dispatchers, the length of road to be managed by each dispatcher having been made short enough to enable him to order signals for all trains at all stations without delay.

On the busiest portion of the road a dispatcher controls about 40 miles. The signal is kept normally in the stop position and, except in case of failure of the telegraph wire, is not moved from its position except by order of the dispatcher. Ordinarily the dispatcher gives each station the proper instruction before the train arrives, but in the absence of an order the operator notifies the dispatcher as soon as a train is known to be approaching. The operator says "No. —— coming," and the dispatcher replies "red," "green" or "white," according as he desires to have the train stopped or sent forward permissively or sent forward with a clear block. A train having been stopped, it must not proceed without a clearance card, nor until the signal is shown in the caution or the safety position. Where a train is to use a side track beyond the station, the conductor remains at the telegraph office until the signal to proceed is shown and then repeats it to the engineman by white or green flag or lantern.

*Previous articles in this series may be found on pages 4, 34 84, 121 and 166.

As some side tracks are not conveniently located, as related to the telegraph office, there is a rule requiring the conductor to go personally to the telegraph office, when necessary, in order to enable the operator to promptly give a clear signal to other trains after the main track is clear. Where an operator has to give a go-ahead signal for two or more trains to go out of a side track which is beyond his signal, he is required to put the signal back to the stop position after each train and then clear it for the next following train only on the order of the train dispatcher.

All conductors and enginemen are required to follow the ordinary time-table and train rules as though no block system existed.

On this road the permissive or caution signal is given by showing a semaphore arm inclined upward at an angle of 60 degrees. To provide for this signal, Mr. Mozier, the Superintendent of Transportation, designed the semaphore shown in the engraving, Fig. 18. The arm A is shown in the normal or stop position, in which it is held by a counterweight B, which is attached to the arm A by chains as shown. The signal is pulled to the safety or all-clear position by pressing downward on the lever C in the cabin, and to the caution or permissive position by moving the lever C upward. If either or both of the connections from the office should break, the counterweight would pull the arm to the "stop" position if it were not already in that position. When the semaphore arm is pulled down, the lamp which in the drawing is hidden behind the red lens, is uncovered and shows white or all-clear. When the arm is moved upward, the green lens G is moved to a position in front of the lamp. The letters X Y Z indicate the positions of an arm on the other side of the post, which is used for signaling trains moving in the opposite direction. In the Mozier signal a hollow post is used, and the lamp, which is suspended in position by a chain running over a pulley, is lowered within the post for cleaning and inspection.

The signal levers in the office are fitted with Mozier's patent shunt for cutting out the keys of the telegraph instruments. By this arrangement the signal may be fastened in the all-clear position, without danger of accident from forgetfulness, as the lever when in that position closes the telegraph circuits around the telegraph keys, while not cutting out the relays, so that it is impossible for the operator to accept another train, or to communicate at all by telegraph, until he has put his signal back to the stop position.

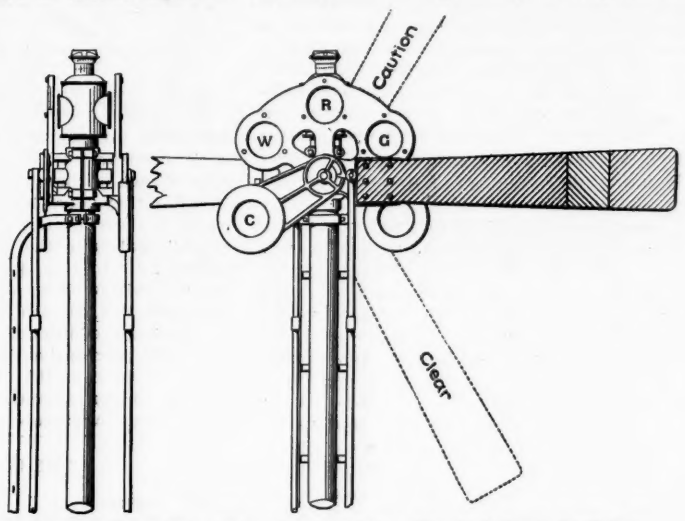


Fig. 19.—Three-Phase Semaphore—Atchison, Topeka & Santa Fe Railway.

Officers of the Erie say that they are well satisfied with the plan of having all block-signal operations performed by direct orders of the dispatcher. The chief advantage claimed is that the station man does not need to give so much time and attention to the telegraph and therefore can better attend to his other duties. At many small stations the agent performs all his duties, including telegraphing, without an assistant, whereas if he had to be on hand at the telegraph instrument to give prompt attention to the needs of trains both at his own station and at the stations east and west of him he could not do so. More dispatchers are required than on other roads, but not nearly so many station men. The dispatchers say that they like to control the block signals in this way. They have a more satisfactory feeling of safety in handling the trains, and the prevention of blockades at terminals and junctions is made easier.

The dispatchers on this line have for several years taken advantage of the block system to make easier the work of sending telegraphic train orders. According to the usual American practice, a dispatcher's telegraphic order, directing a train to run ahead of or later than its regular time, or changing the place at which it shall meet a train running in the opposite direction (on single track), must be repeated back to the dispatcher by the operator who receives it, must be read aloud to the operator by the conductor or engineman, or both, and must be signed by one or both. The dispatcher must not finally approve the order until these signatures have been affixed. These safeguards are adopted to make sure that no collision shall occur from a misreading of the order. But with the block system in force, collisions are provided against at all times by the block-signaling; not only when it has been necessary to issue telegraphic orders, but for every regular movement as well. This being so, dispatchers' orders may be delivered without signature (and even without repetition); for a mistake either in writing or reading could do no worse harm than to cause delay (by giving preference to a wrong train). Taking advantage of this, the Erie dispatchers issue many of their orders on "Form 19," requiring no signatures, and operators are able to deliver to both enginemen and conductors without requiring the train to be stopped. In the case of a heavy train, and especially on an ascending grade, this often obviates annoying and expensive delays. By attaching an order to a light hoop of rattan, wood or metal, it can be delivered to a train running at full freight-train speed, and even faster, the hoop being held (at the end of a stick, if necessary) so that the engineman can run his arm through it.

THE WABASH RAILROAD COMPANY.

Train Register Sheet at ....Block Station .....190..
.....Signalman from Midnight to ..M. ..... Signalman from ...M. to ...M.
..... " " ..... to Midnight.

Westbound.

Train No.	Engine No.	Time Entered Block at ..... Station.	Time here. Arrived.	Cleared Block EK	Departed.	Time Cleared Block at ..... Station WQ	Opr. and Time Ack'd.
.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....

INSTRUCTIONS.

Signalman must enter on his register sheet the number of the train named before responding . . .

Each time before giving clear signal to a train or allowing a train to depart, signalman will perform the three following acts,

BEFORE LETTING A TRAIN GO WEST:

(a) Examine register sheet and be sure that all trains coming east have arrived at your station and cleared block for which you gave "13 B. W."

(b) Examine register sheet and be sure that all trains going west which have departed from your station have arrived at next block station west and cleared block.

(c) Get "13 B. E." from next block station west.

Keep register sheet under train orders. All service must be written in ink on registry sheet and same carefully filed away for future reference.

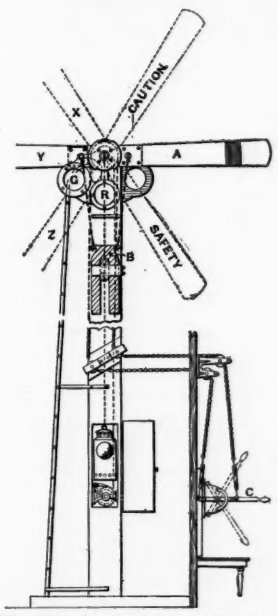


Fig. 18.—Mozier's Three-Position Semaphore Signal.

The Wabash began using the block system in 1887. In the chief features the practice on the Wabash is the same as that of the Chicago, Milwaukee & St. Paul. A signalman must not put his signal in the all-clear position until the train for which it is intended has approached near enough to permit the engineman to see it. This rule is designed to afford a check on the signalman. If an engineman fails to find a signal in the all-clear position when he first comes in sight of it he stops his train at the station or cabin and inquires why the arm was not moved while he was within view of it. Thus the signalman must take care to see that, when he moves the lever to put his signal in the stop position, the arm actually assumes that position, and he must not leave the signal in the all-clear position long enough for two trains to pass under its authority.

The Wabash prints a part of the instructions for signalmen at the bottom of the register sheet on which the record of trains is kept. A copy of one side or half of this sheet (Form 444) is shown in the accompanying table.

The Atchison, Topeka & Santa Fe.—This road has, within the last two years, introduced the use of the block system over several hundred miles of its lines, including some lines on which the number of trains is very small. Some of the block sections are as much as eight miles long. This company, like the Erie lines west of Salamanca, uses a signal by which the caution or permissive indication is given by inclining the semaphore arm upward. The latest design of signal for this purpose, which was made by the Union Switch & Signal Company and which is called "Style D, three-phase," is shown in the accompanying drawing, Fig. 19. The spectacle casting attached to the semaphore blade has three openings, one being filled with red glass, one with green and the third with no glass. The casting is made in this form so as to permit the substitution of a color in the place of "white" for the all-clear night indication when that shall be found desirable. The counterweight, C, is an iron casting which acts as a counterweight and is put on for no other purpose. When the arm has been pulled down to the all-clear position this counterweight acts, as in the case of the ordinary semaphore, to restore the signal to the horizontal position in the event of the breakage of the connecting rod; but when the signal is moved upward to the caution position (by pushing the rod upward) the counterweight becomes disengaged from the blade and remains in the position shown in the drawing. It rests against a stop fixed to the post. In case the connecting rod breaks, the wooden blade falls to the horizontal or stop position by its own weight.

As will be seen from the drawing, this signal is mounted on a cylindrical iron post, and both the eastbound and the westbound signals are fixed to the same post. A single lamp answers for both.

Where the three-position signals have not been introduced the Atchison uses a card for permissive block signaling. In most cases the block signal operators on the Atchison communicate with one another by Morse telegraph, but at a number of stations (14 out of 153) telephones are used. These are small stations where there is little or no freight and passenger business, and attendants are hired for about $10 a month less than the rate paid at ordinary stations.

The Atchison uses Hall automatic block signals on 12 miles of its line, and it also has one section on which the Webb & Thompson train staff is used to maintain the space interval between trains.

The more important lines using the manual block system on single track, aside from those already named, are the Canadian Pacific, the Chesapeake & Ohio, the Chicago, Burlington & Quincy, the Chicago & Northwestern, the Chicago, St. Paul, Minneapolis & Omaha and the Pennsylvania Lines West of Pittsburgh.

TECHNICAL.

Manufacturing and Business.

The Monarch Brake Beam Co. has removed its Chicago offices to Suite 1525, Old Colony Bldg.

Welch automatic lock lifters, made by James A. Ellis, of Detroit, Mich., will be used on the 3,500 cars recently ordered by the Wabash and previously noted.

The Pratt Chuck Co., of Frankfort, N. Y., reports a large increase in the sales of the Positive driving drill chuck, making additional facilities for manufacture necessary. A new 150 h. p. Corliss engin and additional machinery have been installed.

M. Sergey Friede, President of the M. S. Friede Co., 320 Broadway, New York City, has succeeded to the business of the company. A general export and commission business, in addition to the former business of railroad and steamship construction and equipment, will be carried on at the same address.

In the Weser Beitung of Bremen appears an article on the Emperor's recent tour of inspection of the ship yards in which is the following: "The Kaiser inspected the battle ship 'C,' which was commenced Sept. 30th, and showed greatest interest in the working of the pneumatic tools, furnished by Messrs. Schuchardt & Schutte. These tools were employed in drilling, reaming, tapping, calking, chipping, riveting, etc." Messrs. Schuchardt & Schutte are the German representatives of the Chicago Pneumatic Tool Co.

About three years ago the Standard steel platform for passenger cars, designed by H. H. Sessions, was

put up on the market by the Standard Coupler Co. It is now in use on 80 railroads, besides being the adopted standard of the Pullman Co. The President of the Standard Coupler Co., George A. Post, makes the statement that, during the first three months of 1900, shipments of steel platforms have been made for application to equipment of railroads that operate in every state and territory of the United States, except Delaware, and as well in Canada and Mexico.

Iron and Steel.

The Pottstown Bridge Co., operating the Cofrode & Saylor Bridge Works at Pottstown, Pa., has sold the entire plant and business to the McClintic-Marshall Construction Co. of Pittsburgh and Pottstown, which also has a site near Pittsburgh for another plant. Its officers are: President, Charles D. Marshall; Vice-president and General Manager, H. H. McClintic; Secretary and Treasurer, W. S. Mitchell, Pittsburgh.

The Standard Screw Co. has been formed with a capital of $1,500,000 to consolidate a number of screw manufacturing companies in New England.

The Phœnix Iron Co. has a contract to furnish the structural work, 7,000 tons, for the Government printing office at Washington, D. C., at $452,891, and 3,000 tons for the Philadelphia & Reading shops at Reading.

The American Car & Foundry Company.

In announcing another quarterly dividend the directors of the American Car & Foundry Co. make some statements of especial interest. The net earnings for the twelve months ending Feb. 28 were $4,086,000. After paying four quarterly dividends, amounting to $2,036,000, a surplus of $2,050,000 is left. The directors say that it is certain that no dividend will be paid on the common stock out of the past year's earnings for the reason that it has been thought good business policy to increase the working capital from $5,000,000 to $9,000,000 and the surplus will be devoted to this purpose until that amount of working capital is reached. This large working capital is proper because the railroad companies ask for long credit, while the company having a large working capital can discount its own bills and buy for cash, all of which appears to be sound. When we look at the earnings for the twelve months by quarters we find that in the fourth quarter nearly one-third of the net earnings were reached, namely, $1,369,000. The profits of the year from the sales of other products than freight and passenger cars amounted to $1,179,000. The annual meeting of the company will be held on the third Thursday in June and then the regular detailed annual report will be presented. The Audit Company of New York will take charge of the inventory and certify to the report.

East Boston Tunnel.

The full bench of the Massachusetts Supreme Court has dismissed the petition of Causten Browne and others against the City Treasurer of Boston and the Boston Transit Commission, with a view to prevent construction of the East Boston tunnel. It is stated that the Commission will immediately invite bids for the tunnel which is to be an extension of the subway from the main part of the city.

To Sell the John Stephenson Car Works.

The car works of the John Stephenson Co. will be sold at auction by Receiver Albert A. Wilcox on Wednesday, April 25, at 2 p. m., at Elizabeth, N. J. The plant, machinery, tools, buildings, etc., will be sold in one parcel. The supplies, such as lumber, car fittings, etc., will be sold in lots. The works are situated at Bay Way, near Elizabeth, N .J. Permit to inspect the works can be had from the Receiver at his office, 95 Liberty St., New York.

The Isthmian Canals.

In the April issue of the Engineering Magazine appears an article by Mr. George A. Burt, Vice-President and General Manager of the Ohio River RR., comparing the Nicaragua and Panama canals. Although the article is short it contains a good deal of information on a subject which should be carefully considered, particularly by engineers. The decision as to which of the two canals is better for the United States "turns on the practical points of cheapness of cost and of maintenance and flexibility of operation." The sailing distance from New York to the Atlantic end is about the same in each case. The Panama Canal is 46 miles from ocean to ocean and the Nicaragua Canal 174 miles. Twenty-nine miles of the Panama Canal is in excavated channel and 49 miles in the Nicaragua Canal. Nicaragua has 83 miles of slack water and dredged lake channel navigation, and Panama 17 miles in the Summit Lake. The time of passage is estimated at 30.45 hours at Nicaragua and 11.73 at Panama, say 19 hours in favor of Panama for steamers. For towed sailing vessels the difference would be 28 hours. For the cost of completion Mr. Burt takes $133,473,000 for the Nicaragua Canal and $69,924,000 for the Panama Canal. "At Panama the transit is quicker, maintenance and operation probably much cheaper, construction difficulties less and cost only about one-half that of the Nicaragua Canal." This, however, includes no payment to the Panama Canal Company for work done or concession.

Evans's Patent Lock and Block Apparatus.

Evans, O'Donnell & Co., of London, have brought out Evans's patent lock and block apparatus for maintaining a space interval between trains; and an account of the invention is published in a recent number of Transport, though there is no description of the apparatus. The design of this device is to facilitate permissive signaling, where the controlled manual system is in use. A separate arm is provided, below the regular arm of the starting signal, and this is used to indicate that the train may go to the home signal of the next station, but must expect to find the track blocked beyond that signal and before reaching the starting signal. It is said that the construction of the apparatus is such as to prevent the signalman at B from accepting a train from A, on the absolute system, if his own station is blocked between the home and starting signals. Electrical and mechanical devices are connected with the home signal lever so as to effect the desired safeguards without the use of a track instrument or treadle. No additional electrical wires are introduced and the usual lever for the starting signal works both the absolute or ordinary arm and the special or caution arm.

American Steel Sheet Company.

The American Steel Sheet Co. was incorporated in New Jersey March 28, with a capital stock of $52,000,000, half of the amount being 7 per cent. preferred stock. This is the consolidation of a number of sheet steel plants which has been under way for some time. The company is organized as follows: Directors, D. G. Reid, W. T. Graham, W. B. Leeds, Wm. H. Moore, Henry Wick, R. M. Gilbert, W. E. Reis, J. A. Topping, R. J. Beatty, J. G. Battelle, M. I. Arms, J. H. Moore, A. W. Brown and F. S. Wheeler. The officers are: President, D. G. Reid; Vice-Presidents, J. G. Battelle, M. I. Arms, A. W. Brown and J. A. Topping; Treasurer, F. S. Wheeler; Assistant Treasurer and Secretary, H. B. Wheeler; General Western Manager, R. J. Beatty.

A New Cement Plant.

The Newaygo Portland Cement Co. of Newaygo, Mich., has engaged engineers to prepare plans for its new cement plant. Electric transmission of power of the multiphase type will be used.

Heavy Trains on the Union Pacific.

The Union Pacific is handling very heavy trains with its new freight locomotives. In one case 756 tons are hauled over grades 90 ft. to the mile, this weight not including 168 tons for the engine, tender and caboose. Between Cheyenne and Sidney one engine has hauled a train weighing altogether 5,936 tons.

New Bridge for the C., R. I. & P.

About 112 wooden bridges on the Chicago, Rock Island & Pacific will be taken out and replaced with iron bridges or stone or concrete arches. On the line from Omaha to Denver 15 wooden bridges will be replaced at an estimated cost of $50,000. Between Topeka and Harrington 13 new bridges will be built, costing about $35,000. Between Chickasha and Red River 32 wooden bridges will be replaced by stone arches at an estimated cost of $37,000. At Red River three 200-ft. steel spans are now being built to replace wooden trestle work. The piers for these new spans will be from 55 to 60 ft. high, the total cost of the work being $75,000. Between Red River and Fort Worth 51 wooden bridges will be replaced by concrete arches at a cost of about $40,000. Most of the work will be done this year.

The Baldwin Works.

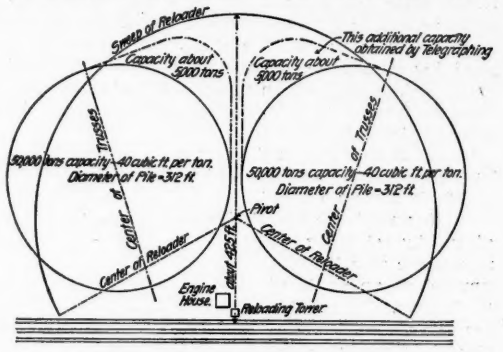
The Baldwin Locomotive Works are now employing 8,000 men. In the year 1900, up to March 31, they had turned out 310 locomotives, of which 40 per cent., or thereabouts, are compound. It will be observed that this is at a rate of over 1,200 locomotives a year, and leaving out Sundays it is at the rate of about 4 locomotives for every working day.

Safety Appliances in Mexico.

March 23, page 186, we mentioned the fact that the Mexican Government has ordered the use on the railroads of that country of certain safety appliances. We now have a little more information on the matter. All freight cars must be equipped with vertical plane couplers, hand holds, grabirons and ladders, and box cars must have suitable running boards projecting beyond the ends of the cars and supported on brackets, and a small railing must be placed on the top of each car around or near the brake staff and wheel. Safety chains were also specified, but it is believed will not be insisted upon. Passenger cars must be provided either with the Miller hook or the M. C. B. coupler and with safety chains. All of the cars of the Mexican Railroad are equipped with link and pin couplers, even, we believe, their passenger cars. Their drawbar height is about 3 ft. 6 in., which will have to be reduced to 34½ in., which is likely to be a complicated matter with the cars having steel underframes. The Mexican Central cars are further along than those of the National, about 95 per cent. being equipped with air brakes and 45 per cent. with M. C. B. couplers. The time for equipment as specified expires Jan. 1, 1905.

The D. L. & W. New Coal Storage Plant at Scranton.

The Dodge Coal Storage Company is building for the Delaware, Lackawanna & Western Railroad at Scranton, Pa., a 110,000-ton coal storage plant, which is the largest ever built on the Dodge system. The diagram gives the general layout of the plant, showing the relative sizes of the coal piles, together with the sweep of the reloader. The two conical piles,


Sweep of Reloader
Capacity about 5000 tons
This additional capacity obtained by Telegraphing
Capacity about 5000 tons
50000 tons capacity—40 cubic ft. per ton.
Diameter of Pile=312 ft.
50000 tons capacity—40 cubic ft. per ton.
Diameter of Pile=312 ft.
Center of Reloader
Center of Reloader
Engine House
Reloading Tower

each with a capacity of 50,000 tons, will be formed in the usual way by two "trimming" machines. The base of each of these piles will be 312 ft. in diameter. If, after they have been formed, more storage capacity is desired, steel chutes will be used to "telegraph" coal from the conveyors at the top of the conical piles to ground just beyond the formed piles but still within sweep of the reloader, thus forming two piles of 5,000 tons capacity each. This method of obtaining additional storage capacity, which is relatively inexpensive, is now quite commonly used. The storage capacity of the plants erected under the Dodge system and now in use in this country and abroad, aggregate over 1,500,000 tons.

THE SCRAP HEAP.

Traffic Notes.

Eastbound shipments from Chicago last week amounted to 204,000 tons, an increase of 44,860 over the record of the previous week.

Over 3,000 farmers passed through Chicago on a single day recently bound for North Dakota. These emigrants, mostly Dunkards, came from Indiana, Ohio, Michigan, Pennsylvania and Virginia.

The Middle Division of the Pennsylvania Railroad has again broken its record. In the month of March the number of freight cars moved over the division was 175,112, or about 4,000 above the highest previous record, which was in the same month a year ago.

George Olds, arbitrator in the Kansas City-Omaha differential, has decided in favor of the Burlington roads; he holds that on provisions to the Southeastern States the rate from Kansas City should be three cents less than from Omaha, instead of six cents less.

The controversy between the Eastern roads and those between Chicago and the Mississippi River concerning the division of through freight rates is reported to have been settled at meetings held in New York last week. It is said that the Eastern lines made some concessions from their first demands.

The Interstate Commerce Commission took testimony in Los Angeles last week concerning the routing of fruit shipments to the Eastern States, which has been the subject of complaint for some time past. Shippers claimed that the railroad companies had unduly favored private fruit car companies, to the detriment of shippers.

The Southern Pacific has advanced passenger fares between San Francisco and points in the San Joaquin Valley, restoring the rates which were in effect before the San Francisco & San Joaquin Valley road was opened, and the newspapers of the State are loud in their denunciation of the company. The constitution of the State expressly forbids such restoration.

Reports have been published that 75 per cent. of the grain which has been held in Chicago elevators the past winter was to be sent to the Atlantic Seaboard by rail at 10 cents per 100 lbs.; contracts having been made at that rate, and the inference was drawn that the railroads intended to underbid lake vessels on grain the coming season. The report is denied, however, by the elevator men in Chicago, who say that cars are so scarce that the railroads have refused an offer at 11 cents. On Monday the published rates were advanced to the basis of 13 cents from Chicago to New York.

A Rail Mill Record.

On March 22 the Illinois Steel Co. again broke the record, this time by turning out from its rail mill 1,442 tons of rails in 12 hours by the day shift. The night shift turned out 1,235 tons, in 12 hours, making a total of 2,677 tons in 24 hours. The best previous record was 1,391 tons in 12 hours. The rolls were shut down 1 hour and 57 minutes during the 24 hours.

Carnegie Co. Improvements.

A dispatch from Ashtabula, O., says that the Carnegie Company is to spend between $1,500,000 and $2,000,000 in improvements at Conneaut Harbor, the lake terminal of the Pittsburgh, Bessemer & Lake Erie. A number of the improvements are now under way. Two more automatic ore unloaders, costing $100,000 each, are to be built at once. The railroad is to have 800 more ore carrying cars of 80,000 lbs. capacity. The Carnegie Company is reported to have secured control of the P. B. & L. E. See RR. News column.

Electric Mail Cars in Chicago.

On the Wentworth Ave. and Halsted St. electric lines at Chicago a new mail service will soon be established for which four new cars are being built. They will make 12 trips a day between Washington St. and Englewood.

Opening of Lake Navigation.

Marine insurance rates for the coming season were put into effect on April 1, and several lines will soon begin their regular passenger service between Chicago and various lake ports.

Northwestern Elevated, Chicago.

The iron for stations and platforms has all been delivered, rails are all laid except on the short strip between the Wells St. bridge and the junction of the road with the Union Loop, and cars are stored on the line north of Graceland Ave. ready for use. From reports of the progress of the work received by the City Engineer of Chicago, it is expected that trains will be running regularly over the line by May 31, when the extension of time granted the road will expire.

South American Notes.

The Buenos Aires Western Ry. proposes making an extension from General Villegas, Argentina, to Trenel, some 50 miles. Mr. David Simson, of Buenos Aires, is General Manager.

Illinois Deep Water-Way Project.

Brig. Gen. John M. Wilson, U. S. A., Chief of Engineers, sent to Congress on March 27 the report of a preliminary survey by a board of army engineers on a 7-ft. and an 8-ft. channel between Lake Michigan and the Mississippi River. The survey has been in progress since November, 1899, and two routes were considered, one by way of the Calumet River and the Sag to the Drainage Canal, which would only utilize 10½ miles of the canal, and the other by the Chicago River and Drainage Canal. The construction of a canal from the present terminus of the Drainage Canal at Lockport to the Joliet basin and from there to a point on the Illinois River below the mouth of the Kankakee River is recommended. The report says a canal 10 ft. deep, 100 ft. wide at the bottom, with 22 ft. clear head room at fixed projections, and with locks 40 x 260 ft., would conform to the requirements of the river channel and provide for the largest barge traffic likely to reach that route. The report is a very comprehensive one, going into details, and the total cost of an 8-ft. channel from Utica, below Kankakee, north to the Drainage Canal, is estimated at $10,400,000.

Chicago Drainage Canal.

The construction of controlling works at the head of the Drainage Canal at Kedzie Ave., Chicago, is under consideration. The controlling works at Lockport are so far away that in cases of emergency it takes too long for the closing of the gates to affect the current in the Chicago River. With new controlling works at Chicago the current in the Chicago River could be stopped in an hour in case of a blockade. No plans have yet been drawn for the new works, but the estimates for them range from $800,000 to $1,500,000. The ordinance compelling the street railroads to lower the tunnels under the river became a law on March 30.

Archbishop's Sons.

The French have a term for those sons of directors, high officials, and other persons with a "pull" who get rapid promotion in the service of the great railroad companies over the heads of other employes who have nothing to recommend them but ability, experience and faithful service. They call them "archbishop's sons," which is not quite respectful to the high dignitaries of the Church.

The Delagoa Bay Railroad Award.

We gave recently (page 168) a concise statement of the questions involved in the Swiss arbitration in the case of the Delagoa Bay Railroad, saying then that the arbitrators had arrived at their decision, which would soon be made public. It is now announced that the tribunal has decided that Portugal must pay $3,000,000 (in round numbers) in addition to $140,000 paid on account in 1890. Furthermore, Portugal must pay interest on this sum at the rate of 5 per cent. a year from June 25, 1899, up to the date of payment. The Portuguese Government must pay into the hands of the Government of the United States the sum necessary to settle McMurdo's claim, and the amount remaining must be paid to Great Britain to be distributed to other claimants. The cost of the arbitration is to be borne by the three parties, namely, Portugal, the United States and Great Britain, the latter governments representing various claimants. The amount of the award appears to be entirely unsatisfactory to everybody but Portugal.

A Railroad for Madagascar.

The new French colony of Madagascar wants a railroad. From the sea to the capital is about 250 miles, and for some distance from the sea the climate in the low country is deadly, so that the population naturally is chiefly in the interior. Now the officials declare that it costs nearly $150 per ton to get freight from the sea to Tananarivo, the capital. For not much more than $9,000,000 they think they could build a railroad, and they ask the French Government to kindly guarantee bonds to that amount.

The Lake Baikal Ferry.

Mention has been made heretofore of the great ice-breaking ferry boat built for Lake Baikal, much after the plan of the one which crosses the Straits of Mackinac in winter. The Lake Baikal boat had its first trial Feb. 8 last, when a canal through the ice had been cut for it part way across the lake. It made the passage of 28 miles and back in 12 hours, breaking through solid ice 2 ft. 7 in. thick for about 10 miles. Two days and four days later it made the passage again, the ice in the channel first broken through not having become quite solid. In places where the solid ice was 3 ft. 3 in. thick a speed of 2 2/3 to 3 1/3 miles an hour was made. The ferry is to serve until the railroad is built around the south end of the lake, which will take some time, as the country is very difficult.

Charging Only What the Traffic Will Bear.

Mrs. Minnie Parkhurst, of Higginson, Ark., has lately made a journey to Rochester, Minn., and, according to veracious Western reporters, she took her whole family of seven persons on one ticket. And this was done without securing any special favors from city passenger agents, or anything of that kind; the puzzle is explained by the fact that all of the children were under five years old. There was one pair of twins a year old, another pair two years old, a boy of three, and a girl of four.

LOCOMOTIVE BUILDING.

The Sibley, Lake Bisteneau & Southern has ordered one locomotive from F. M. Pease, of Chicago.

The Monongahela Connecting has ordered two four-wheel switching engines, with 18 in. x 24 in. cylinders, from the Pittsburgh Locomotive & Car Works.

The Chicago & Eastern Illinois on March 28, ordered from the Pittsburgh Locomotive & Car Works the five 12-wheel two-cylinder compound locomotives noted last week.

The Chicago, Burlington & Quincy, as noted last week, has arranged with the Baldwin Locomotive Works for three more Atlantic type Vauclain compound passenger locomotives to be identical with those illustrated in our issue of May 5, 1899. The only important changes in the locomotives just ordered will be that the drivers will be 84 in. instead of 84¼ in. diam.; the tubes 2 in. instead of 2¼ in. diam., and the tenders will have a capacity for 6,000 gals. of water and will be mounted on two four-wheel trucks. instead of having a capacity of 5,000 gals. and mounted on one six-wheel truck. The engines just ordered are for delivery in October.

The Colorado Springs & Cripple Creek District has ordered from the Schenectady Locomotive Works eight simple consolidation locomotives, for July and October delivery. They will weigh 172,000 lbs., with 155,000 lbs. on the drivers, and have cylinders 21 in. x 26 in. and the drivers 51 in. in diam. The boilers will be of the straight top type with working steam pressure of 180 lbs. and 360 tubes 13 ft. 6 in. long; the fireboxes will be 120 in. x 41 in.; the tank capacity for water, 5,000 gals. and the coal capacity 9 tons. Westinghouse air brakes, steel axles, National couplers, Pyle electric headlights, Monitor injectors, Leach sanding devices, Nathan lubricators and cast steel wheel centers are specified.

The Illinois Central has ordered 10 10-wheel passenger, three switching and two freight engines from the Rogers Locomotive Co. and three switching and 12 freight engines from the Brooks Locomotive Works. The mogul freight engines will have cylinders 20 in. x 28 in., drivers 56½ in. diam., weigh 150,000 lbs., of which 132,000 lbs. will be on the drivers and have radial stay boilers, with a working steam pressure of 200 lbs.; 344 tubes 2 in. in diam. and 13 ft. long; fireboxes, Carbon steel 120 in. x 39¼ in. and a tank capacity for 7,000 gals. of water and 12 tons of coal. The special equipment includes Westingouse-American outside equalized brakes, Monarch brake beams, Leeds reversible couplers, Nathan No. 10 and Ohio No. 10 injectors, U. S. Metallic piston and valve rod packings, Ashton safety valves and steam gages, Leach double sanding devices, Nathan lubricators, French springs, Latrobe truck and tender wheel tires, cast steel wheel centers and Barnes whistles.

The Plant System has ordered from the International Power Co., operating the Rhode Island Locomotive Works, six simple ten-wheel freight and five simple ten-wheel passenger locomotives, for July delivery. The freight locomotives will have cylinders 20 in. x 28 in., drivers 65 in. diam., and will weigh 150,000 lbs., of which 110,000 lbs. will be on the drivers. The boilers will be of the extended wagon top type, with a working steam pressure of 200 lbs., and 350 charcoal iron tubes, 2 in. in diam. and 14 ft. long. The fireboxes will be of steel, 112 in. x 41 in. The tank capacity for water will be 5,200 gals. and coal capacity 8½ tons. The passenger engines will have cylinders 19 in. x 28 in., drivers 73 in. diam., will weigh 142,000 lbs., of which 106,000 lbs. will be on the drivers and have 300 tubes, the other dimensions being the same as the freight locomotives. All the engines will have Westinghouse air brakes, American open-hearth steel axles, Gollmar bell ringers, Janney couplers, Star headlights, Monitor injectors, U. S. Metallic piston and valve rod packings, Coale safety valves, Leach sanding devices, Nathan lubricators, French springs, Crosby steam gages, McKee-Fuller truck and tender wheels and Latrobe driving wheel tires.

CAR BUILDING.

Orrin Bros. have ordered one circus car from the American Car & Foundry Co.

The Shippers' Refrigerating Car Co. has ordered 40 refrigerator cars from F. M. Pease, of Chicago.

The Choctaw, Oklahoma & Gulf is considering ordering some more cars. The number is reported to be 500.

The Great Northern of Canada is again getting prices on from 300 to 600 box cars, and it is reported the order will be given this week.

The New Orleans & Northeastern has ordered one combination mail and baggage car from the American Car & Foundry Co.

The Chicago Great Western is reported to have ordered from the American Car & Foundry Co. the 100 stock cars referred to March 16.

The Kishacoquillis Valley will order some new rolling stock. F. F. Whittekin, Technical Director of the Antioquia RR., of Colombia, South America, has bought a controlling interest in the road. He is now at his home in Tionesta, Pa.

The Atlantic Coast Line on March 29 ordered from the Pullman Co. 350 box cars, for September delivery. They will be of 60,000 lbs. capacity, measure 34 ft. 5 in. long, 8 ft. 5 in. wide and 6 ft. 9½ in. high, inside, and have Westinghouse brakes, Tower couplers, Butler draft rigging, pressed steel journal box lids, Armitage roofs and Pullman axles, bolsters and brake shoes. The specifications for brasses are open.

The Southern is building at its Lonsdale (Tenn.) shops 100 plain gondola and 100 flat cars of 60,000 lbs. capacity. The former will measure 35 ft. 6 in. long over end sills, 9 ft. wide over floors and 34 ft. high over sides; the flat cars will be 40 ft. long and of the same width and height as the gondola cars. The specifications call for open-hearth steel axles, Westinghouse brakes, Butler draft rigging, cast iron journal boxes with pressed steel M. C. B. lids and Lucol paint.

The Ohio Central, as noted March 23, is having five coaches built by the Pullman Co. Two are for the Kanawha & Michigan and three for the Toledo & Ohio Central. All were ordered on March 8 and are for September delivery. They will be 60 ft. long, 10 ft. ¼ in. wide and 14 ft. 3⅞ in. high and will seat 72 passengers. The special equipment specified includes Cambria steel axles (Coffin process), Congdon brake shoes, Westinghouse air brakes, lead-lined brasses, Tower couplers, Pantasote curtains with Forsythe curtain fixtures, Consolidated steam heating system, 36-in. wheels with Latrobe tires, Standard steel platforms, Pullman wide vestibules and Pullman standard trucks, roofs, door fastenings and journal boxes.

The Wabash cars ordered from the American Car & Foundry Co., and noted last week, are for August and September delivery. The 3,000 box cars, to be delivered Sept. 1, will be of 60,000 lbs. capacity, weigh 31,500 lbs. and measure 36 ft. long and 8 ft. 4 in. wide, inside, and 7 ft. 7 in. high. In addition to the special equipment noted last week they will have Scott springs and Wabash standard draft rigging and dust guards. All will have diamond trucks; American Steel Foundry Co.'s steel bolsters will be used on 800, Shickle, Harrison & Howard bolsters on 1,000, Simplex bolsters on 1,100 and Schoen pressed steel bolsters on 100. The 500 coal cars are for Aug. 1 delivery and will be 80,000 lbs. capacity, weigh 31,400 lbs. and measure 36 ft. long and 8 ft. 6½ in. wide, inside, and 3 ft. 8¾ in. high. Diamond trucks with American steel bolsters will be used on 300 and Kindl trucks on 200. They will also have Scott springs; Gould malleable iron draft rigging on 100 cars; Wabash standard draft rigging on 100 cars, and Wabash standard dust guards.

BRIDGE BUILDING.

ALEXANDRIA, LA.—The Alexandria & Pineville Bridge Co. has been organized to build a bridge across the Red River at this point. F. M. Welch, Mayor of Alexandria, is Secretary of the company and desires to hear from bridge builders.

ALMONTE, ONT.—Beckwith and Ramsay counties will co-operate in building a bridge over the Mississippi River.

AUBURN, N. Y.—It now seems probable that the proposed bridge over the Owasco River to replace the present Lizette St. structure will be built.

BINGHAMTON, N. Y.—Bids are wanted April 20 by Chas. W. Buchholz, Chief Engineer, Erie Railroad, for a viaduct over the Erie and the D., L. & W. tracks, as stated in our advertising columns.

BLOOMINGTON, ILL.—The city is at present negotiating with several railroad companies in regard to building bridges at railroad crossings.

BOSTON, MASS.—The bridge which is reported proposed over Fort Point Channel at Olive St., we are told, is contemplated as a part of an agreement with the New England RR., the State and the city made a number of years ago. It is not known when the bridge will be built.

BUFFALO, N. Y.—A bill is before the Assembly appropriating $15,000 for building a steel bridge over the Clark & Skinner Canal at Ohio St. in Buffalo.

The following are the bids received March 27 by the Department of Public Works for the superstructure of the Seneca St. Bridge over the Buffalo River:

Buffalo Bridge & Iron Works, Buffalo, N. Y.	$19,950
Bellefontaine Bridge & Iron Co., Bellefontaine, O.	20,000
Massillon Bridge Co., Massillon, O.	20,400
King Bridge Co., Cleveland, O	20,550
Variety Iron Works Co., Cleveland, O.	21,000
Toledo Bridge Co., Toledo, O.	21,000
Pittsburgh Bridge Co., Pittsburgh, Pa.	23,550

CANAJOHARIE, N. Y.—A bill is before the Assembly appropriating $12,000 additional for a hoist bridge over the Erie Canal at this village.

CANASTOTA, N. Y.—A bill is before the Legislature amending the act for a bridge over the Erie Canal at Peterboro St., this village.

CAZENOVIA, N. Y.—A bill is before the Legislature providing for a steel bridge at Foreman St., over the outlet to Cazenovia Lake reservoir in this village, and appropriating $15,000 toward the work.

CHAMBERLAIN, S. D.—It is reported that bids are being received for the bridge authorized by Congress, over the Missouri River between Chamberlain and Oacoma, S. D. It is to be a combined railroad, wagon and foot passenger bridge, and to be built by the Chicago, Sioux Falls & Pacific.

COUNCIL BLUFFS, IA.—It is stated that the Illinois Central will soon begin work on the $100,000 steel viaduct to the East Omaha bridge. The Omaha Bridge & Terminal Co. originally had the contract.

CLEVELAND, O.—Nothing has been done in regard to the viaduct over Kingsbury Run excepting the introduction of a bill into the Legislature authorizing a bond issue for it. (March 23, p. 191.)

The Park Board has awarded contracts to the Northern Ohio Paving & Construction Co., Cleveland, O., for two Melan arches, 34 ft. and 36 ft. span, 64 ft. and 80 ft. wide, respectively, in Wade Park.

CUMBERLAND, MD.—The West Virginia Central & Pittsburgh will build an iron bridge 160 ft. long over Market St. It will consist of one girder 60 ft. long, and two girders of 50 ft. each. Bids will be wanted some time during April by the Purchasing Agent. It will cost about $16,000.

DES MOINES, IA.—J. H. Kilmer has the contract for building a Melan arch bridge at North Sixth Ave., at $76,000. (March 2, p. 143.)

DOYLESTOWN, PA.—Bucks County Commissioners have under consideration a new bridge at Kaber's Ford, New Britain, and one at Warrington. Elmer E. Funk, County Commissioner.

ELGIN, ILL.—The plans for the proposed bridge over the Fox River at Chicago St., which is to cost about $38,000, have been accepted by the Street Committee. (Feb. 16, p. 110.)

EUFAULA, I. T.—A suspension bridge over the Canadian River about five miles south of this place will be built by a company now forming at Eufaula. The bridge is estimated to cost $40,000.

FERNDALE, CAL.—The Humboldt County Supervisors have been petitioned for a bridge over the Van Duzen, estimated to cost $50,000.

GANANOQUE, ONT.—A steel bridge will be built to replace the Raglan bridge.

GAHANNA, O.—The Columbus Bridge Co. has the contract for the new bridge over the Big Walnut Creek for Franklin County at $11,200. The structure will be 168 ft. long and 22 ft. wide.

GREIG, N. Y.—A bill is before the Legislature to provide for a bridge over Black River at Pratt's Landing, between the towns of Greig and Turin in Lewis County, the cost not to exceed $16,000.

HAMILTON, ONT.—Again it is reported that plans are being made for a bridge to replace a structure over the London Branch of the Grand Trunk Ry.

HONESDALE, PA.—The Commissioners of Wayne County, the Supervisors of Clinton Township and officers of the Erie and Delaware & Hudson railroads are considering abolishing the grade crossing at Forest City. It is proposed to build a bridge over Allegheny Creek also.

HUNTINGTON, N. Y.—The Town Clerk will receive bids until April 6 for a highway bridge across Centerport Harbor. C. P. Darling, Engineer in charge. A. O. Gildersleeve, Commissioner.

JACKSON, MISS.—Bridge bonds for $10,000 were sold April 3.

KANKAKEE, ILL.—The contract for the concrete bridge across the Kankakee River has not been let. At the second opening of bids the only bid received was that of the Geisel Construction Co. of St. Louis, Mo., which was $41,446. The specifications have been changed slightly. E. B. Warriner, City Clerk.

KANSAS CITY, MO.—It is proposed to change the grade on McGee St. from Twentieth to Twenty-third St., necessitating a viaduct from Twentieth St. to the Belt Line.

The Allen Ave. viaduct plans have been submitted to the Board of Public Works. Estimated cost, $75,000. The viaduct will cross the tracks of the Kansas City, Fort Scott & Memphis and the Burlington, extending from Brook St. to Wyoming. Henry A. Wise, City Engineer.

LOCKPORT, N. Y.—The contract for the lift bridge over the Erie Canal at Chapel St. has been let to the Havana Bridge Works of Montour Falls, N. Y., for $18,950. The King Bridge Co. of Cleveland, O., bid $23,820.

MERRIMACK, N. H.—An iron bridge about 108 ft. long over the Souhegan River, recently destroyed, will shortly be replaced, according to report.

MINDEN, N. Y.—An additional appropriation has been made for the steel bridge proposed over the Erie Canal in this town.

NEW HARTFORD, CONN.—The Central New Englang RR. has placed orders with the Edge Moor Bridge Co. for one viaduct 344 ft. long, of 10 spans, at New Hartford, and one bridge 255 ft. long, consisting of four spans, over the Housatonic River.

NEW HAVEN, CONN.—Chas. Waterhouse and others have petitioned the city for a drawbridge over the West Branch of Mill River at Grand Ave.

NEW YORK, N. Y.—The Senate has passed a bill providing for a railroad bridge across the East River at Hell Gate. The bridge, which is to be of a single span, is proposed by the New York Connecting RR. Co., to be used for railroad purposes only.

OTTAWA, ONT.—The Ottawa Improvement Commission wants bids April 19 for a steel bridge over Rideau River, with ashlar masonry foundation, of four spans 125 to 170 ft. long. The superstructure is estimated to cost $17,000, and the substructure $18,000. E. G. O'Brien, Secretary.

PITTSBURGH, PA.—The Board of Officers of the Corps of Engineers, U. S. A., has finished its investigation into the new Fort Wayne bridge matter.

QUINCY, MASS.—The Legislature has been petitioned for a new bridge at Quincy Point, the expense to be divided between Norfolk and Plymouth counties. C. F. Knowlton, Commissioner of Public Works.

RED LAKE FALLS, MINN.—A number of bridges and culverts are to be built in Red Lake County this summer. For specifications, etc., address Adam Zeh, County Auditor. O. T. Tandberg, County Treasurer.

ROSWELL, GA.—A new bridge will be built over the Chattahoochee River to connect Fulton and Cobb counties at Roswell. It will be about 600 ft. long. E. B. Rosser is Chairman of the County Commissioners.

ST. THOMAS, ONT.—A steel bridge will be built over the ravine near the city line.

SAN ANGELO, TEX.—Tom Green County has voted to issue $10,000 of bonds for a bridge across the North Concho River in San Angelo.

SAN MATEO, CAL.—A large concrete bridge is proposed for B Street, the main thoroughfare.

SPRINGFIELD, ILL.—A viaduct is proposed across the Wabash RR. at Tenth and Cook Sts.

SYDNEY, CAPE BRETON ISLAND.—The Dominion Iron & Steel Co. will build a bridge across the Sydney River.

SUFFERN, N. Y.—The Erie RR., according to report, proposes to build two bridges in this town at a cost of about $40,000.

TOMS RIVER, N. J.—The Ocean County Board of Freeholders wants new bids for a bridge over Crosswick's Creek, New Egypt.

TONAWANDA, N. Y.—A bill to authorize a steel bridge over the Erie Canal in Tonawanda, and appropriating $9,000 toward the work, is before the Legislature.

TOPEKA, KAN.—Plans are being prepared to rebuild the bridge over Martin Creek on Willow Ave., in Auburndale.

TYRE, N. Y.—The Superintendent of Public Works is authorized by a bill before the Legislature to build a bridge across the Seneca River at Old Turnpike between Montezuma aqueduct and the West Shore RR., in the town of Tyre, and a new bridge across the Canandaigua River at the same point.

WASHINGTON, D. C.—A bill has been introduced in Congress appropriating $100,000 for widening and improving the bridge across the East Branch at the Navy Yard.

WATERFORD, N. Y.—A bill is before the Legislature appropriating $10,000 for a bridge over the Champlain Canal at Division St., in the town of Waterford, Saratoga County.

Twelve thousand dollars is available for the proposed swing bridge over the Champlain Canal near Burton's sawmill in this town.

WEST TROY, N. Y.—By an act before the Assembly the State Superintendent of Public Works will prepare plans for a lift bridge over the Erie Canal at Nineteenth St., to be operated by water power in place of the present elevated bridge.

WINNIPEG, MAN.—The Canadian Pacific Ry. wants bids for bridges at the following points: Cook's Creek, East Selkirk, Straberry Creek, Kaministiquia, Fish Creek, Pipestone Creek, Laggan and Murray Park. Plans at office of J. Woodman, Engineer Western Division, this city.

WYANET, ILL.—Bids for a double track railroad bridge over the Illinois & Mississippi Canal are wanted at the United States Engineer Office, Chicago, Ill., until April 10, by Major J. H. Willard, Corps of Engineers, U. S. A.

YUTAN, NEB.—We are told that the bridge proposed across the Platte River will be about one mile long, but it is doubtful if it will be built as Saunders County has refused its consent. (March 23, p. 192.)

Other Structures.

BURNHAM, COL.—The Denver & Rio Grande is preparing to rebuild the shops which were destroyed by fire some time ago. The total cost of the improvements proposed is estimated at $250,000.

BOSTON, MASS.—The New England Structural Co. has a contract from the United States Steel Co. for the main building, which will be 120 x 200 ft. (Feb. 23, p. 126.) A contract has been let for two cranes, one 40 and the other 20 tons, to the Shaw Electric Crane Co. of Muskegon, Mich. The steel plant will have two 15-ton open-hearth furnaces and one 24-pot crucible furnace.

BRYAN, TEX.—The Calvert, Waco & Brazos Valley is reported to have secured land for a new depot at this place.

DENVER, COL.—Wm. J. Hill & Co., of Denver, Col., have the contract at $89,000 for the machine shop, car shop and roundhouse for the Colorado & Southern shops to be built at this place. The work includes brick, stone and carpenter work. (May 2, p. 143.)

EAST ST. LOUIS, ILL.—Two large warehouses at this place owned by the Mobile & Ohio RR. and the Exporters' Warehouse Co., were destroyed by a fire March 23, causing a loss of about $30,000.

HAMMOND, IND.—The Erie RR. is building at this place a coal storage plant of the Dodge system.

HUNTINGTON, W. VA.—The Chesapeake & Ohio contemplates enlarging its shops at Huntington. A building 100 x 90 ft. is proposed.

LEWIS, QUE.—Bids are wanted by the Intercolonial Ry. for improvements to the station at this place.

MIDDLETOWN, N. Y.—Work was begun March 25 on rebuilding the car shops of the New York, Ontario & Western at Middletown, which were destroyed by fire March 20. The company is doing the work. The main building will be 200 x 80 ft. 8 in., and will have a wing 180 ft. x 60 ft. A dry house 20 x 50 ft. will also be built.

PHILADELPHIA, PA.—The Edge Moor Bridge Works has filed plans with the Bureau of Buildings for a large shed and grain elevator to be built at Pier 48, south wharves, Delaware River, for the Pennsylvania RR. The elevator will be 686 ft. x 100 ft., and will be of steel frame.

The Pennsylvania RR. Co. has been receiving bids for a new station at Germantown Junction. The main waiting-room will be 87 ft. long and the building, with the additions, will have a length of 125 ft.

POUGHKEEPSIE, N. Y.—The New York Central & Hudson River RR. proposes to make some improvements at the station at Poughkeepsie, but the plans have not been completed.

ST. JOSEPH, MICH.—A large storage warehouse for freight is to be built on the dock property recently bought by the Indiana, Illinois & Iowa. It will be used chiefly for salt from Manistee, Mich., while awaiting shipment from Michigan points to the west and south.

SALTILLO, MEX.—The Coahuila & Zacatecas RR. will build machine shops at this place, in addition to other improvements which will aggregate over $700,000.

TOWNSEND, DEL.—Work is under way on a new passenger station at this place by the Pennsylvania RR., to cost $3,000.

VANCOUVER, B. C.—The Canadian Pacific proposes to spend $98,817 for wharves and other terminal works at Vancouver.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad associations and engineering societies see advertising page xi.)

The American Railway Association.

The spring meeting of the American Railway Association will be held at the Auditorium Hotel, Chicago, Ill., on Wednesday, April 25, at 11 a. m. Reports will be presented by the following Committees: Executive Committee, Committee on Train Rules, Committee on Car Service, Committee on Safety Appliances, Joint Committee on Interlocking and Block Signals, Nominating Committee, Committee on the Metric System, Committee on Statistical Inquiry, and the Committee on Standard Dimensions of Box Cars. The annual election of officers will take place at this meeting. Two members of the Executive Committee, three members of the Committee on Train Rules and three members of the Committee on Nominations are also to be elected. Presidents, Vice-Presidents, General Managers, General Superintendents or other officials connected with companies that are members of the Association are invited to be present. Copies of the proceedings, at 50 cents per copy, can be had from W. F. Allen, Secretary, 24 Park Place, New York.

American Society of Civil Engineers.

At the meeting of April 4 a paper by Mr. William B. Landreth was presented on the subject of "Stadia Topographic Surveys." An abstract of this will be printed in the Railroad Gazette.

At the meeting of April 18 a paper by Mr. George W. Rafter will be presented on "The Flow of Water Over Dams." This paper is 94 pages, with many illustrations and diagrams. It is the summing up of a great amount of observation and experiment and will probably be one of the points of departure for students and engineers.

At the meeting of May 2 a paper by Mr. J. M. Moncrieff will be presented on "The Practical Column Under Central and Eccentric Loads." This is a paper of 98 pages, with numerous diagrams showing results of tests.

The returns received up to the time of publication of the March Proceedings of the Society show that 59 persons connected with the Society, accompanied by 43 guests, will sail in time to be present at the annual convention in London.

American Institute of Electrical Engineers.

The 141st meeting was held in New York on Wednesday evening of last week. The paper of the evening was presented by Mr. Joseph Sachs on "The Evolution of Safe and Accurate Fuse Protective Devices." Mr. Sachs gave a review of the work already done in this field, pointed out some of the defects in different types of fuses and proceeded to discuss some of the principles of the different classes of fuses now on the market. The results were given of many tests with different types of fuses and the relative merits of the enclosed and the open fuse were considered. After the paper was read, tests were made to illustrate some of the points raised by Mr. Sachs. The discussion which followed lasted until after 11 o'clock and brought out the results of much experience with different types of fuses. The following nominees have been selected by the Council for the annual election to take place May 15; For President: Carl Hering. For Vice-Presidents: Gano S. Dunn, Arthur V. Abbot and W. L. R. Emmet. For Managers: W. S. Barstow, Calvin W. Rice, C. T. Hutchinson, R. D. Mershon. For Treasurer: G. A. Hamilton. For Secretary: R. W. Pope. Dr. M. I. Pupin has been appointed a Manager to serve during the unexpired term of the late S. Dana Greene.

The Engineers' Club of Philadelphia.

At the meeting of the Club to be held on Saturday of this week, the Standing Committee on the Relations of the Engineering Profession to the Public will report on the advisability of the Club taking action toward the resumption of Government measurements of available water supply in the vicinity of Philadelphia. The papers for the evening are: "The Drainage and Protection of the Philadelphia Lowlands," by Harrison Souder; "High-Speed Toothed Gearing," by James Christie, and "Interchangeable Gearing," by Wilfred Lewis.

Protecting Metal Surfaces.

At the business meeting, March 17, Prof. A. H. Sabin, of New York, delivered an address upon "The General Chemical Aspects of the Corrosion of Structural Metals, and the Principles Involved in their Protection," and illustrated his remarks by the exhibition of 235 steel and aluminum plates which were exposed for about two years to the action of fresh and salt water. There were originally prepared about 300 plates, each 12 in. wide by 18 in. long, and thick enough not to buckle, and these were divided into three sets, one being placed in the fresh water in Lake Cochituate, near Boston; another in the sea water at the New York Navy Yard, and the third in sea water at the Norfolk Navy Yard. The plates, after being made perfectly clean under a wire brush, were coated with oil paints, varnishes or enamel paints, with a variety of pigments, so that a great number of different coatings were tested. The results seemed to show in general that in pigment paints the character of the pigment makes little difference in the permanency of the coating. Oil paints seemed to wear much worse than varnish paints, while of the latter, those containing a larger proportion of oil are the best. Baking is not generally beneficial, except in the case of enamels. Fresh water, of course, proved to be much less severe than salt water upon the coatings. Prof. Sabin also briefly described the commercial process of making paints and varnishes. At the conclusion of his remarks the general subject was discussed by Messrs. Edgar Marburg, S. P. Sadtler. C. M. Mills, William R. Webster, Joseph T. Richards and L. Y. Schermerhorn, and a vote of thanks was extended to Prof. Sabin for his kindness in coming to Philadelphia to present this matter before the Club.

PERSONAL.

(For other personal mention see Elections and Appointments.)

—Mr. M. W. Hartley, Supervisor of the Louisville & Nashville at Lebanon, Ky., died March 25.

—Mr. C. K. Holliday, for many years a Director of the Atchison, Topeka & Santa Fe, died at Topeka, Kan., March 29, aged 76 years.

—Mr. James Instan, Auditor of Disbursements of the Pennsylvania Company, died at Sewickley, Pa., April 2. He was born in England in 1833.

—Mr. B. B. Comegys, a Director of the Pennsylvania Railroad, died March 29 at his home in Philadelphia, Pa. He was born at Dover, Del., on May 9, 1819.

—Mr. Cooper Anderson, who recently resigned as Auditor of the Rio Grande Southern Railroad, has been appointed General Superintendent of the Telluride Power Company.

—Col. George H. Elliott, Corps of Engineers, U. S. A., died last Friday at Marmion, Va. He was born in Massachusetts March 31, 1831, and was graduated from the United States Military Academy in 1851.

—Mr. T. F. Hastings, until the time of his recent appointment as Superintendent of the Minnesota Transfer Ry. Co., has been continuously with the Chicago, Burlington & Quincy since he began railroad work Oct. 15, 1876. He served successively as switchman, brakeman, freight and passenger conductor, yard master, traveling passenger agent and trainmaster. His new appointment at St. Paul, Minn., took effect March 14.

—Mr. H. U. Wallace, the new Assistant Superintendent of the Illinois Central, has been with that company since he entered railroad service as Assistant Engineer on Jan. 1, 1894. He was born at Rock Island, Ill., Nov. 15, 1872, and was graduated in the Chicago Manual Training Class of 1892, and afterward took a special course in civil engineering at Purdue University. His special services with the Illinois Central were as Resident Engineer of Lake Front Improvement from Nov. 1, 1895; Roadmaster of the First Division, Chicago Terminal, Sept. 30, 1896; Roadmaster of the Tenth Division at Louisville, Ky., Feb. 20, 1898; and Assistant Superintendent of the Evansville District, Louisville Division, March 1, 1900.

—As already noted, Mr. J. S. Booth became Master Mechanic of the Carolina & Northwestern, with headquarters at Chester, S. C., on March 1. Mr. Booth was born in Gloucester County, Va., Feb. 8, 1858. His first railroad work was as machinist in Huntington, Va., for the Chesapeake & Ohio in 1882. Since that date he has worked in railroad and locomotive shops of the Cincinnati Southern, Illinois Central, the East Tennessee, Virginia & Georgia and the Western of Alabama. In 1889 he was made gang foreman in the shops of the Chesapeake & Ohio at Richmond, Va., and in 1891 general foreman of the Richmond & Danville shops at Salisbury, N. C. When the Southern built new shops at Spencer, S. C., he was made roundhouse foreman and later foreman of the erecting shop, in which position he remained until his recent appointment.

—Capt. Frederick Yeaman Dabney, C. E., a graduate of the Rensselaer Polytechnic Institute of the class of 1857, died at his home, Crystal Springs, Miss., on March 16, in the 65th year of his age. Capt. Dabney was of an old and well-known Virginia family and was born at Fredericksburg, Va., on March 22, 1835, his father, Augustine Lee Dabney, afterward taking up his residence in Mississippi, where most of Mr. Dabney's life was spent.

Capt. Dabney commenced his professional life, after leaving Troy, in 1857, on what was at that time the Southern Railroad extension; was on the Gulf and Ship Island Railroad surveys in 1859-60; the Mississippi levees 1866-67; the North Missouri RR., 1868; the Decatur & Aberdeen and the Natchez & Jackson surveys in 1869; the New Orleans, Jackson & Great Northern RR., 1870-75; the New Orleans-Pacific RR., 1876-79; the Vicksburg & Pacific RR., 1880-84; and the Georgia Central System, as Chief Engineer of Construction from 1886 until the fall of 1891, when he retired from active life to his home at Crystal Springs, Miss., considerably broken in health. Capt. Dabney was on active duty in the Confederate States service, 1861-65, chiefly in the artillery and engineer corps as Captain of Engineers, and had charge of the defenses of Port Hudson at the time of its capture, being taken prisoner and sent to Johnson's Island.

Captain Dabney had singular intellectual force and activity, and extensive practical experience. He was a man of strong natural convictions, positive and vigorous in his judgments, never occupying a middle ground, always faithful in the expression of his opinions and having a profound contempt for subterfuges or evasions of any kind. One who knew him well can testify to his true and loyal friendship, kept up by frequent correspondence for nearly half a century, notwithstanding the Civil War, on which opposite sides were taken, and without a personal meeting for more than forty years.

ELECTIONS AND APPOINTMENTS.

Baltimore & Ohio.—Hugh G. Bowles has been appointed Superintendent of the Monongahela River Division and Fairmont Terminals, with headquarters at Fairmont, W. Va. Effective April 1.

Blackwell, Enid & Southwestern.—The officers of this company referred to in the Construction column are: President, Ed. L. Peckham; vice-president, O. J. Flemming; treasurer, W. C. Robinson; secretary, C. J. Peckham; chief engineer, J. W. Beatty, all of Blackwell, O. T.

Burlington & Missouri River RR. in Nebraska (C., B. & Q.).—E. Gillette has been appointed Assistant Superintendent of the Wyoming Division, succeeding H. C. Nutt, transferred.

Canadian Pacific.—J. G. Sullivan is Principal Assistant Engineer of the C. P. in British Columbia instead of Chief Engineer of the Columbia & Western as incorrectly stated two weeks ago (p. 193).

Chesapeake & Ohio.—The following new Directors have been elected: S. M. Prevost, Third Vice-President; Samuel Rea, Fourth Vice-President, and N. P. Shortridge, a Director of the Pennsylvania; H. J. Hayden, Second Vice-President, and H. McKay Twombly, a Director of the New York Central & Hudson River. W. T. Smith, heretofore Assistant Master Mechanic at Covington, Ky., has been appointed Division Master Mechanic at Richmond, Va., succeeding T. S. Lloyd, resigned.

Chicago & Northwestern.—The jurisdiction of W. D. Cantillon, Division Superintendent at Winona, Minn., has been extended to include the Dakota Division, owing to the resignation of J. S. Oliver. F. N. Stewart has been appointed Assistant Superintendent of the Dakota Division, succeeding H. R. Sanborn, who becomes Acting Superintendent of the Western Iowa Division, succeeding S. M. Braden, transferred.

Chicago & Southeastern (of Ind.).—H. Moore, General Superintendent at Anderson, Ind., has resigned.

Chicago, Burlington & Quincy.—J. F. Deems, Division Master Mechanic at West Burlington, Ia., has been appointed Assistant Superintendent of Motive Power.

Chicago Great Western.—A. W. Munster has been appointed Superintendent of Bridges, succeeding J. I. Banks, assigned to other duties. The position of Superintendent of Bridges and Buildings has been abolished.

Chicago Junction.—At a meeting of the stockholders R. Fitzgerald, General Superintendent and Acting Traffic Manager, was elected Vice-President, succeeding Jas. H. Ashby. Mr. Fitzgerald was also elected a Director.

Chicago, Rock Island & Pacific.—Henry Neumeister has been appointed General Foreman at Chicago, Ill., succeeding B. H. Hawkins, resigned.

Cincinnati, New Orleans & Texas Pacific.—Joseph E. Gould has been appointed Master Mechanic of the Chattanooga Division, with headquarters at Chattanooga, Tenn., succeeding V. B. Lang, resigned. Effective April 1.

Cincinnati, Richmond & Muncie.—The officers of this company referred to last week in the Construction column (p. 209) are: President, W. A. Bradford, Boston; Vice-President, A. J. Christy, Chicago; Secretary, F. L. Patrick, Columbus, O.

Cleveland, Cincinnati, Chicago & St. Louis.—H. C. Allen has been appointed Supervisor of Track at Terre Haute, Ind., succeeding W. J. Long, resigned.

Colorado & Southern.—H. Bronner has been elected Secretary and Treasurer, succeeding Chas. Wheeler, resigned.

Davenport, Rock Island & Northwestern.—C. E. Dearborn, Chief Engineer at Davenport, Ia., has resigned.

Florence & Cripple Creek.—J. J. Frey has been elected President, with headquarters at Denver, Col.

Great Northern.—F. von Schlegell has been appointed Assistant Superintendent of the Breckenridge Division, with headquarters at Breckenridge, Minn. L. W. Bowen succeeds Mr. F. von Schlegell as Assistant Superintendent of Fergus Falls Division, with headquarters at Melrose, Minn. A. E. Long has been appointed Assistant Superintendent of Kalispell Division, with headquarters at Kalispell, Mont., succeeding Wm. N. Neff, resigned. Effective April 1.

Illinois Central.—The following Division Superintendents have been appointed: H. McCourt, of the Chicago Division, with headquarters at Chicago, succeeding Mr. Baker; J. C. Dailey, of the St. Louis Division, at Carbondale, Ill., to succeed Mr. McCourt; H. Baker, of the Amboy Division, at Clinton, Ill., succeeding Mr. Dailey; and H. U. Wallace, of the Freeport Division, at Freeport, Ill., succeeding Mr. Dill. H. R. Dill has been appointed Assistant Superintendent of the Evansville District, Louisville Division, with headquarters at Evansville, Ind., succeeding Mr. Wallace. A. H. Egan has been appointed Assistant Superintendent of the Chicago Division, in direct charge of the Transportation service of the Chicago Terminals, with headquarters at Central Station, Chicago. Effective April 1.

Kansas City Southern.—At a meeting of the stockholders held April 1, Samuel W. Fordyce was elected President, also a Director, succeeding S. Pettit.

Louisville & Atlantic.—Jas. B. McCreary, President, has resigned.

Maricopa & Phoenix & Salt River Valley.—L. C. Masten has been appointed Auditor, with headquarters at Phoenix, Ariz., succeeding H. S. Creighton.

Missouri Pacific.—W. C. Watrous, heretofore Superintendent of Transportation of the St. Louis Southwestern, has been appointed Superintendent of Transportation of the M. P. J. O. Pattee, formerly Superintendent of Motive Power of the Great Northern, has been appointed Superintendent of Locomotive and Car Department of the M. P., succeeding F. Rearden, resigned.

New York and New Orange.—W. W. Cole has been elected President, with headquarters at Elmira, N. Y., succeeding Robert Grimes.

New York Central & Hudson River.—James H. Hustis, heretofore Assistant Division Superintendent at New York, has been appointed Superintendent of the Harlem Division, succeeding James H. Phyfe, resigned. Effective April 1.

New York City Rapid Transit.—E. P. Bryan, heretofore Vice-President and General Manager of the Terminal RR. Association of St. Louis at St. Louis, Mo., has been appointed General Manager of the operating company for the Rapid Transit Subway Construction Company, with headquarters at New York.

S. L. F. Deyo, heretofore Assistant Engineer of the New York, New Haven & Hartford, has been appointed Chief Engineer of the Construction Company.

Omaha Bridge & Terminal.—E. T. Stotesbury has been elected President, succeeding J. L. Welsh; J. H. Daniels, Secretary, succeeds H .W. Yates as Treasurer and G. A. Clark succeeds P. J. Nichols as Superintendent, with headquarters at Council Bluffs, Ia.

Pecos Valley & Northeastern.—W. B. Gaskins has been appointed Superintendent of Motive Power and Machinery, with headquarters at Roswell, N. M., succeeding C. M. Stansbury, resigned.

Pere Marquette.—George H. Kimball has been appointed Chief Engineer, with headquarters at Grand Rapids, Mich., succeeding J. J. McVean, Chief Engineer of the Grand Rapids District and Geo. M. Brown, Chief Engineer of the Saginaw District, resigned (p. 193). Mr. McVean will, however, remain with the company as Consulting Engineer. H. D. Norris has been appointed Acting Purchasing Agent, with headquarters at Grand Rapids and Saginaw.

Philadelphia, Wilmington & Baltimore (Pennsylvania).—J. C. Smith has been transferred to Washington, D. C., as Supervisor, succeeding Mr. Latrobe, transferred. J. R. McGraw succeeds Mr. Smith at Clayton, Del., as Supervisor, and John S. Elliott succeeds Mr. McGraw at Georgetown, Del.

Richmond, Petersburg & Carolina (S. A. L.).—E. R. Williams of Richmond was on March 31 elected President, succeeding Dewitt Smith, resigned.

Santa Fe, Prescott & Phoenix.—J. J. Wragovich, heretofore Assistant Auditor, has been appointed Auditor, relieving F. J. Sarmiento to this extent.

Seaboard Air Line.—The title of W. T. Reed, Superintendent of Motive Power and Machinery, has been changed to Mechanical Superintendent.

Sibley, Lake Bisteneau & Southern.—W. S. Smith, heretofore General Traffic Manager of the Louisiana & Arkansas, has been elected Vice-President and Traffic Manager of the S., L. B. & S., with headquarters at Kansas City, Mo.

Terminal RR. Association of St. Louis.—W. S. McChesney, Jr., has been appointed Vice-President and General Manager of the T. RR. A. of S. L., succeeding E. P. Bryan, resigned.

RAILROAD CONSTRUCTION.
New Incorporations, Surveys, Etc.

ARIZONA ROADS.—A road is being built, according to report, from Seligman on the Atchison, Topeka & Santa Fe, to run south 80 miles to the Hillside mines and Eureka mining district. The terminus is to be within 25 miles of the Santa Fe, Prescott & Phoenix, in the Date Creek District. A portion of the grade of the abandoned Prescott & Arizona Central is to be used. Eugene Brady O'Neill of Prescott, Ariz., is the principal promoter.

ATLANTA, STONE MOUNTAIN & DAHLONEGA.—This company has been incorporated in Georgia to build a railroad from Atlanta northeast via Stone Mountain to Lawrenceville and thence north via Buford and Cumming to Dahlonega, with branches to the granite quarries of the Lithonia and Stone Mountain districts, in all about 75 miles. Chas. J. Haden of Atlanta is the Attorney.

BANCROFT & PEMBROKE.—This company will build a railroad from Bancroft, Ont., on the Ironton, Bancroft & Ottawa, to run northeast about 100 miles to Pembroke, on the Canada Atlantic.

BIRMINGHAM, SELMA & NEW ORLEANS.—F. M. Abbott of West Point, Miss., who recently bought a controlling interest in this property (March 23, p. 194), has asked the citizens of Selma, Ala., and Dallas County, to subscribe $175,000 for extending the line from Martin's Station west about 20 miles into Marengo County. The line now runs from Martin's east 20 miles to Selma.

BLACKWELL, ENID & SOUTHWESTERN.—The route of this recently incorporated line is from Blackwell, O. T., on the Atchison, Topeka & Santa Fe, southwest 48 miles via Beggs and Lamont to Enid, on the Chicago, Rock Island & Pacific. Permanent location is made only as far as Lamont, 18 miles. Contracts are to be let about April 10. There will be a very few light curves. The officers are given under Elections and Appointments. (Official.)

BOSTON & ALBANY.—Preliminary surveys have been made for a three-mile branch near Millbury, Mass., connecting one of the mills of the American Steel & Wire Co. with the Millbury Branch.

BRITISH COLUMBIA ROADS.—Captain John Irving and others of Victoria, according to report, will build a three-mile road over the portage from Atlin Lake to Lake Arm, to cost about $30,000. They propose to have it ready for operation by the middle of June.

BROCK'S GAP.—The act approving this company's charter was approved in Virginia March 5. The company, with a capital stock of $100,000, is to build a line from a point near Broadway, Rockingham County, Va., up Shenandoah River through Brock's Gap to a point on the West Virginia State line. The incorporators are: Park Agnew, Alexandria, Va.; Frederick Mertens, William M. Mertens, Samuel B. Shank and Homer S. Carr. (March 2, p. 145.)

CHATTAHOOCHEE VALLEY.—Amended articles of incorporation have been filed for the proposed extension from Riverview, Ala., southeast about 25 miles via Mechanicsville to Phoenix near Columbus, Ga., with a northern terminal at or near Lanett in Chambers County. L. Lanier of Lanett is President. (Dec. 1, 1899, p. 835.)

CHICAGO, BURLINGTON & QUINCY.—McShane & Co. are reported to have the contract to furnish ties and bridge material for the proposed Big Horn Southern extension from Toluca, Mont., southwest 110 miles to Cody, Wyo. (March 30, p. 209.)

CHICAGO, SIOUX FALLS & PACIFIC.—Plans are being prepared, according to report, for building the proposed steel bridge across the Missouri for this line. The road as projected is from Sioux Falls, S. D., west to the Wyoming State line. It was incorporated in October, 1898. R. E. Woodworth of Sioux Falls was an incorporator. (Oct. 28, 1898, p. 786.)

COAHUILA & PACIFIC.—A contract has been let, according to report, for this proposed line from Saltillo, State of Coahuila, on the Mexican National, to run west 203 miles to Torreon. Forty miles of steel is reported at Saltillo. A. W. Lilliendahl of Saltillo is President and General Manager. (April 2, 1899, p. 288.)

COLORADO & SOUTHERN.—Work is to be begun at once, according to report, on the proposed extension up Long's canyon to the Maxwell land grant in Las Animas County, Col.

DELAWARE, LACKAWANNA & WESTERN.—Among the improvements proposed on the Morris & Essex will be the double tracking of the line from Morristown, N. J., to Denville. (March 16, p. 177.)

Right of way is being obtained for a cut-off connecting the main line east of Waterloo, N. J., with the Sussex Division.

EASTERN & NORTHWESTERN.—This company has been incorporated in Michigan, with a capital stock of $1,280,000, to build a railroad from Benton Harbor or St. Joseph on Lake Michigan, to run east about 160 miles to a point on Lake Erie. The principal office is Benton Harbor. The stockholders are: J. C. Caldwell, Oakley Curry, Isaac W. Lucas, J. G. Haley, Joseph P. Thresher, J. J. Miller, and Geo. M. Thresher.

FORT WORTH, CORSICANA & SABINE PASS.—This company has been incorporated in Texas, with a capital stock of $400,00, to build a railroad from Fort Worth southeast about 300 miles via Corsicana to Sabine Pass. The headquarters are at Corsicana, Tex. C. H. Allyn is President, and F. C. Hand, Vice-President, both of Corsicana.

GEORGIA PINE.—Surveys are reported in progress for the proposed extension from Arlington, Ga., north about 35 miles to Cuthbert.

GREAT NORTHERN.—Contracts are reported let for the extension from Wenatchee, Wash., to run north about 130 miles to Republic. (March 2, p. 146.)

HARRIMAN & NORTHEASTERN.—Finel surveys are in progress for the proposed extension from Stevens, Tenn., west about nine miles to Wartburg and building may be begun soon. (July 7, 1899, p. 499.)

INTER-MOUNTAIN.—Efforts are being made to build a railroad from Belleville, Pa., on the Kishacoquillis Valley (see Railroad News column), to run northwest about 15 miles to McAlavey's, to be virtually an extension or the K. V. It will open up a large section of country rich in iron ore and agricultural products. F. F. Whittekin of Tionesta, Pa., will have charge of the enterprise.

KANSAS-TEXAS.—This company was incorporated in Missouri March 31, with a capital stock of $500,000, to build a railroad from a point in Macon County, on the Excello Branch of the Wabash, to run southwest about 50 miles to Clifton Hill, on the main line of the Wabash. The incorporators are: A. P. Moore, W. P. Heath, J. J. McDonald, H. W. Hollingsworth and C. H. Tolle.

LAKE BENNETT.—Notice is given of application to the British Columbia Legislative Assembly for an act to incorporate this company to build a railroad from a point on the Dyea River, near the provincial boundary, to run to a point at or near Lake Bennett, and thence to the sixtieth parallel of latitude. Frank Higgins of Victoria, B. C., is solicitor.

LAKE SHORE & MICHIGAN SOUTHERN.—An officer writes that the company expects to build about three miles of double track on the Youngstown, O., end of the line. This is all that the company has in contemplation at this time. (March 30, p. 210.)

LITTLE ROCK NORTHERN.—Surveys are reported in progress for this proposed line from Little Rock, Ark., north to Springfield, Mo. Chas. P. Coleman of Philadelphia is Vice-President, and Andrew Johnson of Mena, Ark., is the principal stockholder. (March 30, p. 210.)

LOUISVILLE & NASHVILLE. — Surveyors are reported in the vicinity of Walnut Grove for the proposed extension from Oneonta, Ala., northeast toward Guntersville. (Sept. 1, 1899, p. 620.)

LOUISVILLE, EVANSVILLE & ST. LOUIS.—The only extensive improvements contemplated this year by this company are the building of a new yard at the East St. Louis terminals, which will represent about 10 miles of new track and switches. The materials for the fillings will be taken from the hills just east of East St. Louis. The improvements will bring about changes in grade equivalent to 1¼ per cent. instead of the present 2 and 3 per cent. grades. (Official.)

MANHATTAN (ELEVATED).—Work was begun last Monday on the Bedford Park extension of the Third Avenue line from the present terminus at 176th St., to run north about 1½ miles to Fordham Station. Naughton & Co. have the contract.

MEXICAN NATIONAL.—In his annual report, dated March 17, President W. G. Raoul admits the impracticability, from a financial point of view, of making the road broad gage for some years, and recommends a number of important improvements. These include the change of curves and grades on divisions most in use; the replacing with heavier rails and thorough ballasting; the replacement of many of the original iron bridge structures and wooden trestles and the increasing of terminal and shop facilities at Mexico, Monterey and Laredo. The estimated cost of improving the alignment and grades is $1,200,000 in Mexican currency; for improvement of the terminal facilities, $80,000 Mexican currency; for replacing the bridges, $250,000 gold. The mountain sections required to be laid are between Mexico and Toluca, 45.6 miles, of which 28.6 miles is 4 per cent. grade, and between Monterey and Carneros, 92 miles of 2 per cent. grade. The total cost is estimated at $522,000 gold. He suggests that beginning with 1901 about 2,000 tons of rails be annually put down on the line for the following 10 years. The total capital requirements for these undertakings he places at $1,056,000 gold.

MISSISSIPPI ROADS.—The Kingston Lumber Co. of Laurel is reported building a railroad from that city north about 50 miles to Forest, and 13 miles is completed. About 30 miles more is to be finished within the next 18 months. F. W. Pettibone is Superintendent.

MISSOURI, KANSAS & NORTHWESTERN.—This company was incorporated in Missouri March 29, with a capital stock of $150,000, to build the road already noted under this title from Mineral City, Kan., on the Missouri, Kansas & Texas, to run east via Columbus and Galena, Kan., and Joplin, Mo., Webb City, Carterville and Oronogo to Carthage. Among the incorporators are: E. O. Bartlett and J. C. Stuart of Webb City; J. C. Murdock of Galena and Richard Nevins, Jr., of Joplin, Mo. (March 2, p. 146.)

NORTH LANARK.—Wm. H. Wylie, of Niagara, Ont., writes that he has lately been appointed a director of this company. The proposed road is only a short line, designed to tap some iron ore and mineral lands in Lanark County. Building will probably not be begun until bonuses are voted by the legislatures or municipalities.

PACIFIC & IDAHO NORTHERN.—Work is to be begun at once, according to report, on the extension from Cambridge, Id., to Council Valley, 25 miles. Most of the grading has been completed. (Dec. 1, 1899, p. 836.)

PENNSYLVANIA.—Press reports state that a branch is to be built from Centre Hall, Pa., to a tract of timber land in Potter Township, Centre County, owned by Witmer & Co.

PENNSYLVANIA COMPANY.—M. M. Snodgrass, who represents the Board of Trade of Mechanicsburg, O., is seeking the co-operation of the Board of Trade of Columbus to induce the P. Co. to build a line from Columbus west about 50 miles through Mechanicsburg to Urbana. A connection between the two cities is now made by way of Milford Center.

PERE MARQUETTE.—This company, in connection with the Manistee & Northeastern, will make important changes in terminal arrangements at Manistee, Mich., this year, including the use of a union depot.

PETERSBURG & CLAREMONT TERMINAL RAILROAD & IMPROVEMENT.—This company has been incorporated in Virginia, with a capital stock of $10,000,000, to build a railroad from Petersburg east about 25 miles to Claremont, and also to operate steamships, together with street railroads in Petersburg or Claremont.

PHILADELPHIA & READING. — Preliminary surveys are reported completed for the proposed extension from Shippensburg, Pa., to run southwest about 30 miles to Cherry Run. (Dec. 29, 1900, p. 901.)

ST. LOUIS SOUTHWESTERN.—A spur about 1,000 ft. long has been graded near Wautauga, Tex., to connect this line with the Missouri, Kansas & Texas and the Texas & Pacific.

SOUTHERN IOWA.—This company was incorporated in Iowa March 28, with a capital stock of $400,000, to build a railroad from a point on the Ottumwa, Cedar Falls & St. Paul Division of the Chicago & Northwestern, near Stark, Mahaska County, to run southwest 37 miles via Lovilla to a point about five miles northwest of Melrose, Monroe County, with a a branch from Noville northwest 15 miles, and another branch of four miles in Mahaska County. The principal office is at Cedar Rapids, Ia. The incorporators are Daniel D. Bathrick and Henry N. Ferguson.

TEXAS CENTRAL.—An officer confirms the statement that surveys are being made for a branch from some point on the main line, not determined, through the Thurber (Tex.) coal fields to a point five or six miles beyond. It is not yet determined whether the line will be built this year. (March 23, p. 194.)

TORONTO, HAMILTON & BUFFALO.—M. A. Pigott has taken the contract for the trestle work on the spur line at Hamilton, Ont., and Emerson Goodale of Hamilton for the grading. The trestle work is to be completed by May 15 and the grading by June 20. (Nov. 3, 1899, p. 770.)

TROY, WILLIAMSTOWN & GRAFTON.—Preliminary surveys have been made and a certificate of incorporation will soon be filed with the New York Secretary of State for this proposed line from Troy east through Berlin, Petersburg and Grafton to Williamstown, Mass.

UNION PACIFIC.—Arrangements are being made to enlarge the trackage facilities at Council Bluffs, Ia., and also for improvements on the track between Omaha and South Omaha. About 500 men are to be employed and the work is to cost $500,000.

WABIGOON, MANITOU & RAINY LAKE.—The bill to incorporate this company passed the Ontario Legislature on March 29. The road is to run through the Lake of the Woods district connecting the Ontario & Rainy River Line with the Canadian Pacific between Tache and Dryden, and thence northward. (Feb. 2, p. 80.)

WISCONSIN ROADS.—A press report from Green Bay states that a contract has been let for building the railroad from the John Arpin Lumber Co., extending from Bruce, Chippewa County, about 50 miles through timber land. It is stated that 12 miles will be built this year.

WYOMING ROADS.—Surveys are being made for a railroad from a point on the new extension of the Chicago, Burlington & Quincy, about two miles east of Laramie, Wyo., to run west about 25 miles along the Laramie River and Chugwater Creek to Wheatland.

GENERAL RAILROAD NEWS.

ARKANSAS & OKLAHOMA.—The company has authorized a mortgage on the entire proposed 175 miles of property at $10,000 per mile, to issue 30-year 5 per cent. gold bonds, payable semi-annually. The Bankers' Trust Co. of New York, according to report, is to be trustee. The road is being operated from Rogers, Ark., to Southwest City, Mo., 36½ miles, and 16 miles more to Grand River, I. T., are building. (Railroad Construction column, Nov. 17, 1899, p. 800.)

ATLANTA & CHARLOTTE AIR LINE (SOUTHERN).—The $750,000 6 per cent. income bonds of 1877, due Feb. 1, are being paid at the Guaranty Trust Co., New York, together with the semi-annual interest. The bonds will be extended by arrangement to Jan. 1, 1907, at 4 per cent. interest.

BENNINGTON & RUTLAND.—By unanimous vote the directors have authorized the lease of this property to the Rutland. (Feb. 23, p. 128.)

CAROLINA & NORTHWESTERN.—A syndicate has acquired nearly all the stock and a majority of the bonds of this property which it proposes to extend and develop. The property went into the hands of the syndicate on Dec. 15. Plans for refunding the existing indebtedness and issuing securities with which to change the gage and to build extensions are being perfected. A stockholders' meeting has been called at Chester, S. C., on April 24 to act on the proposed increase of capital stock and the executing of a new mortgage (March 30, p. 210.)

CHICAGO & ALTON.—This company has been reincorporated, with a capital stock of $20,000,000 of non-cumulative preferred, and $20,000,000 common stock. The new company is to take over the property of the old, and to acquire new lines in Illinois, including the northern part of the St. Louis, Peoria & Northern, recently bought. The old company under its charter was not permitted to acquire new roads. (March 23, p. 195.)

CLEVELAND & PITTSBURGH.—The Farmers' Loan & Trust Co., New York, has given notice that proposals would be received up to April 2 for consolidated mortgage 7 per cent. bonds of Aug. 1, 1867. (Dec. 8, 1899, p. 854.)

CORNWALL & LEBANON.—Thirteen car trust bonds for $1,000 each have been drawn for payment April 2 at the office of the Pennsylvania Company for Insurance on Lives and Granting Annuities, Philadelphia.

COSHOCTON & SOUTHERN.—The property is advertised to be sold under foreclosure at Coshocton, O., on May 4. Mr. Robert Blickensderfer, President of the Wheeling & Lake Erie of Cleveland, O., is the new Receiver. Rebuilding the line is in progress. (March 23, p. 194.)

ERIE & HURON.—Stockolders of the Lake Erie & Detroit River will meet at Walkerville, Ont., May 1, to consider the terms of the proposed amalgamation of the Erie & Huron with that company. It was stated some time ago that the L. E. & D. R. had bought the E. & H. (Aug. 26, 1898, p. 620.)

GILA VALLEY, GLOBE & NORTHERN.—F. J. Lisman & Co., New York, offer $200,000 first mortgage 5 per cent. gold bonds at 104 and interest. These are guaranteed by the Southern Pacific. (May 12, 1899, p. 345.)

GULF & INTERSTATE.—Press reports state that the Kansas City, Pittsburgh & Gulf reorganization committee has obtained control of this line which extends from Beaumont, Tex., to Port Bolivar, 70.35 miles. It was reported last fall that the road has been acquired by the Gulf, Beaumont & Kansas City. (Oct. 13, 1899, p. 720.)

HOUSTON & TEXAS CENTRAL (S. P.).—Notice is given of the withdrawal of 75 consolidated mortgage bonds for payment at 110 and accrued interest, at the company's office, New York, on and after May 31.

By order of the U. S. District Court at Galveston, Tex., March 21, the Receiver of this road was discharged. (Nov. 10, 1899 p. 788.)

KANSAS CITY & NORTHERN CONNECTING.—Judge Amos Thayer of the U. S. Circuit Court at St. Louis, Mo., has authorized the receivers to borrow $525,000 at not to exceed 5 per cent. interest, to be expended on this road; also $300,000 on the same terms, to be expended on the Omaha & St. Louis and the Omaha, Kansas City & Eastern. These roads went into the hands of receivers Jan. 2 (K. C., P. & G., Jan. 12, p. 30.)

KISHACOQUILLIS VALLEY.—Mr. F. F. Whittekin, Technical Director of the Ferro-carril de Antioquia, Colombia, S. A., now at his home in Tionesta, Pa., has bought a controlling interest in this line and with others will equip the road with additional rolling stock, repair the bridges and make general improvements, particularly at the terminals. The road runs from Belleville, Pa., on the Pennsylvania, to Reedsville, 9.2 miles. (See Inter-Mountain RR., Railroad Construction column.)

LOUISVILLE & NASHVILLE.—The Union Trust Co., New York, will buy at par and interest on Sept. 1, $40,000 of the Cecilia branch bonds of 1877. (March 30, p. 210.)

MEXICAN NATIONAL.—Notice is given of the withdrawal for payment at par of 120 6-per cent. 40-year first mortgage prior lien bonds for $1,000 each at the office of the company in New York City, interest to cease June 1. (March 30, p. 210.)

NATIONAL TEHUANTEPEC.—Notice is given under the power of the Executive of the United States of Mexico by the law of the Congress of June 2, 1899, that the bonds of the loan for £700,000 issued in 1899 and later by the Mexican Government, and still in circulation, will be paid at par after April 1 in London by Seligman Bros., 18 Austin Friars.

NORTHERN CENTRAL.—Mortgage currency bonds for $1,126,000, due April 1, are being paid at the company's office, Baltimore, Md. (Feb. 2, p. 80.)

PITTSBURGH, BESSEMER & LAKE ERIE.—The Carnegie Co., according to report, has bought 10,000 shares of P., B. & L. E. stock from Colonel Samuel B. Dick, Chairman of the road, at a price said to be about $400,000. It is stated that Colonel Dick is to relinquish the chairmanship of the road and to give up all his contracts.

PITTSBURGH, JOHNSTOWN, EBENSBURG & EASTERN.—A decision of Judge Love has been filed at Hollidaysburg, Pa., which annuls the lease of the Altoona & Beech Creek RR. to this company and orders the surrender of the same within 20 days from the date of the decree. (July 14, 1899, p. 516.)

RICHMOND, FREDERICKSBURG & POTOMAC.—At a meeting of the stockholders on March 14 it was voted to change the method of voting the capital stock so that each share would be represented by a vote. Heretofore a holder of 20 shares or less has been entitled to one vote for each share. A holder in excess of 20 shares up to 100 shares was entitled to one vote for each share up to 20, and one vote for each additional four shares. A holder of more than 100 shares was entitled to one additional vote for each 10 shares in excess of 100.

Press reports state that there is a proposition that this road be taken over by the Pennsylvania and the Baltimore & Ohio, to be used by the Atlantic Coast line and the Seaboard Air Line. This would obviate the necessity of paralleling the road by the S. A. L. (Feb. 9, p. 96.)

ROME & CARROLLTON.—This property was sold at public auction at Rome, Ga., on March 29 to the Chattanooga, Augusta & Southern, which has already obtained substantially all the first mortgage bonds. (March 4, 1899, p. 171.)

STUTTGART & ARKANSAS RIVER.—John M. Taylor, trustee, who bought this property for $50,000, has withdrawn his bid and the property is to be again sold by C. C. Waters, Master in Chancery, on April 16. (March 9, p. 162.)

THIRD AVENUE (NEW YORK).—Hugh J. Grant, the Receiver of the parent company, has been made permanent Receiver of the Forty-second Street, Manhattanville & Nicholas Avenue. Application has been made to issue Receiver's certificates to complete portions of the building recently in progress, and to equip the road. The Receiver has been granted permission to make terms with the Metropolitan for increased electric power, and also to make certain purchases of supplies. (March 30, p. 210.)

TOLEDO & OHIO CENTRAL.—F. J. Lisman & Co., New York, offer $200,000 of general mortgage 5 per cent. gold bonds due June 1, 1933, at 98½ and interest. (Jan. 5, p. 14.)